Specifications - Analog I/O Modules

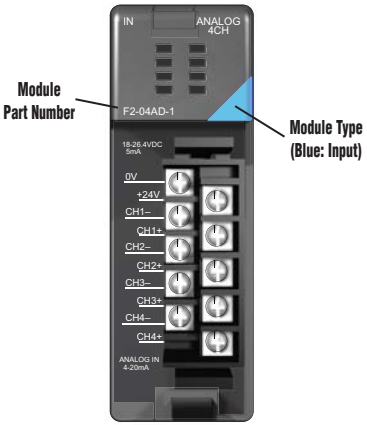
In This Chapter:

Analog I/O Module Overview 6–2
Analog I/O Modules 6–6

Analog I/O Modules Overview

There are 19 analog I/O modules that can be used in local and remote I/O bases. The specifications and wiring diagrams for these modules are found in this chapter. Each analog I/O module is identified as an "Input", "Output", or "Input/Output" module using the color coding scheme shown below. A blue bar on the front panel signifies an Input I/O module, a red bar signifies an Output I/O module and a White bar signifies a combination Input/Output module.

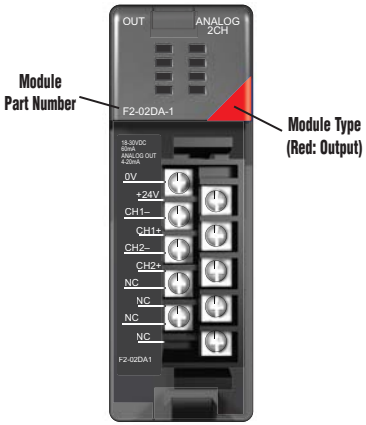
Analog Input Modules



Analog Input Modules			
Part Number	Number of Channels	Description	See Page
F2-04AD-1	4	Analog Current Input	6-6
F2-04AD-2	4	Analog Voltage Input	6-9
F2-08AD-1	8	Analog Current Input	6-12
F2-08AD-2	8	Analog Voltage Input	6-15
F2-04RTD	4	RTD	6-18
F2-04THM	4	Thermocouple	6-22

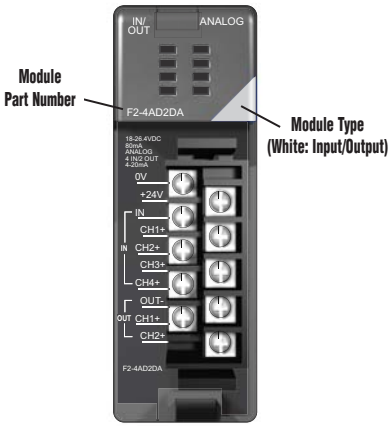
Analog I/O Modules Overview - continued

Analog Output Modules



Analog Output Modules			
Part Number	Number of Channels	Description	See Page
F2-02DA-1(L)	2	Analog Current Output	6-28
F2-02DA-2(L)	2	Analog Voltage Output	6-30
F2-02DAS-1	2	Isolated Analog Current Output	6-34
F2-02DAS-2	2	Isolated Analog Voltage Output	6-36
F2-08DA-1	8	Analog Current Output	6-39
F2-08DA-2	8	Analog Voltage Output	6-41

Analog Input/Output Module



Analog Input/Output Modules				
Part Number	Number of Input Channels	Number of Output Channels	Description	See Page
F2-4AD2DA	4	2	Analog Current Input/Output	6-44
F2-8AD4DA-1	8	4	Analog Current Input/Output	6-47
F2-8AD4DA-2	8	4	Analog Voltage Input/Output	6-54

Analog I/O Modules Overview- continued

How to Access the Analog I/O Modules

With the Do-more PLC, the WX and WY memory addresses are assigned to exchange analog data with the analog I/O modules. (WX = Analog input data, WY = Analog output data and setup data) X addresses are also assigned to some analog I/O modules to indicate the status of those analog I/O modules.

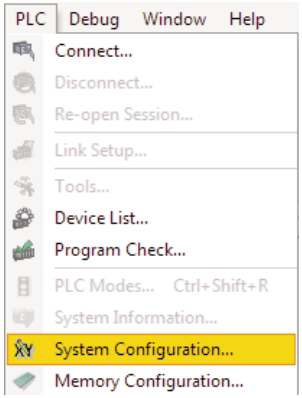
The following table shows how many X, WX and WY addresses are assigned to each analog I/O module type.

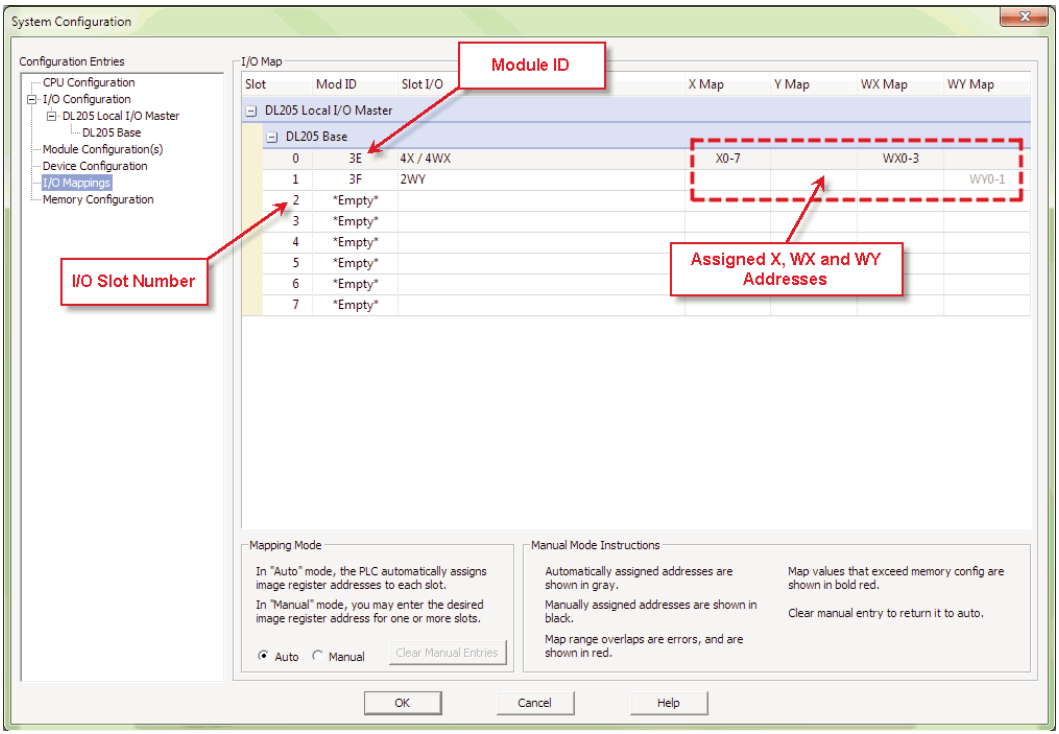
Analog Input/Output Module Addressing				
Part Number	Module ID	X	WX	WY
F2-04AD-1	0x3E	8	4	-
F2-04AD-2	0x3E	8	4	-
F2-08AD-1	0x3B	8	8	-
F2-08AD-2	0x3B	8	8	-
F2-04RTD	0x3C	8	4	-
F2-04THM	0x3C	8	4	-
F2-02DA-1(L)	0x3F	-	-	2
F2-02DA-2(L)	0x3F	-	-	2
F2-02DAS-1	0x4E	-	-	2
F2-02DAS-2	0x4E	-	-	2
F2-08DA-1	0x4F	-	-	8
F2-08DA-2	0x4F	-	-	8
F2-4AD2DA	0x3D	8	4	2
F2-8AD4DA-1	0x37	8	8	7
F2-8AD4DA-2	0x37	8	8	7

Analog I/O Modules Overview- continued

You can check which X, WX and WY addresses are assigned to each analog I/O module in the I/O Mapping tab of the System Configuration window, as shown below.

Select the pull-down menu PLC > System Configuration to open the System Configuration window and click the I/O Mapping tab.





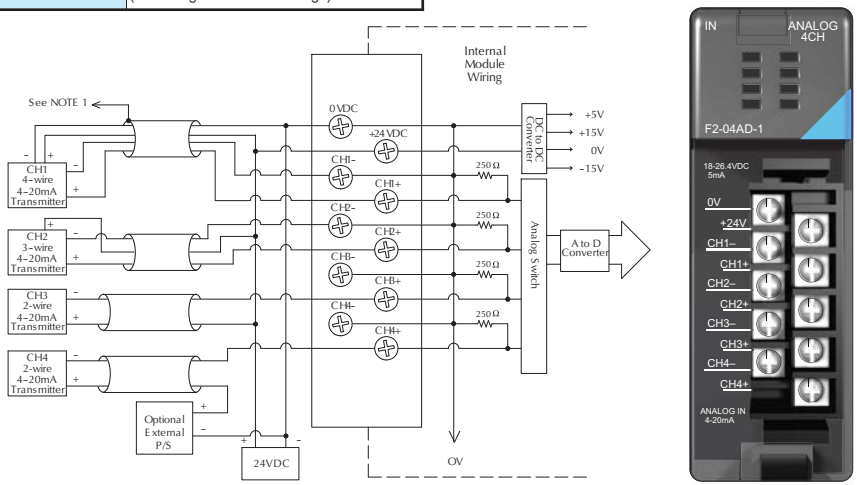
F2-04AD-1(L) Analog Input

F2-04AD-1(L) 4-Channel Analog Current In	
Number of Channels	4, single ended (1 common)
Input Ranges	4 to 20 mA current
Resolution	12-bit (1 in 4096)
Active Low-pass Filtering	-3 dB at 120 Hz, 2 poles (-12 dB per octave)
Input Impedance	250Ω ±0.1%, 1/2W current input
Absolute Maximum Ratings	-40 mA to +40 mA, current input
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	4 channels per scan maximum
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum
Input Stability	±1 count
Full Scale Calibration Error (not incl. offset error)	±12 counts max., @ 20 mA current input
Offset Calibration Error	±7 counts max.,@ 4mA current input
Step Response	F2-04AD-1: 4.9 ms to 95% of F.S. change F2-04AD-1L: 4 ms to 95% of F.S. change
Maximum Inaccuracy	±.5% @ 77ºF (25ºC) ±.65% 32º to 140ºF (0º to 60ºC)
Accuracy vs. Temperature	±50 ppm/ºC maximum full scale (including max. offset change)

Recommended Fuse	0.032 A, Series 217 fast-acting, current inputs
Base Power Required 5 VDC	F2-04AD-1: 100 mA F2-04AD-1L: 50 mA
External Power Supply	F2-04AD-1: 5 mA maximum, +10 to +30 VDC F2-04AD-1L: 90 mA maximum, +10 to +15 VDC
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158°F (-20º to 70ºC)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

Note 1: Shields should be grounded at the signal source.



More than one external power supply can be used provided all the power supply commons are connected. A Series 217, 0.032A, fast-acting fuse is recommended for 4-20 mA current loops. If the power supply common of an external power supply is not connected to 0 VDC on the module, then the output of the external transmitter must be isolated. To avoid "ground loop" errors, recommended 4-20 mA transmitter types are: 2 or 3 wire - Isolation between input signal and power supply or 4 wire - Isolation between input signal, power supply, and 4-20 mA output.

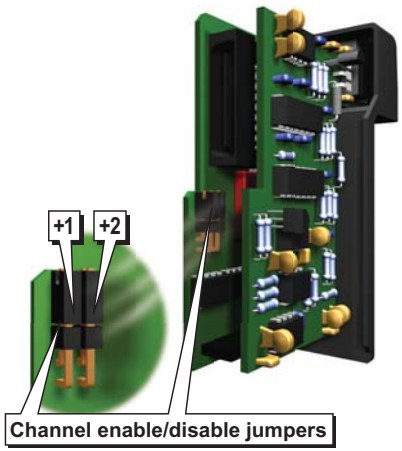
F2-04AD-1(L), Analog Input - continued

Setting the Module Jumpers

There are two channel selection jumpers, labeled +1 and +2, that are used to select the number of channels that will be used. See the figure below to find the jumpers on your module. The module is set from the factory for four channel operation. Any unused channels are not processed, so if you only select channels 1 thru 3, channel 4 will not be active. The following table shows how to use the jumpers to select the number of channels. Unused jumpers can be stored on a single post to prevent losing them.

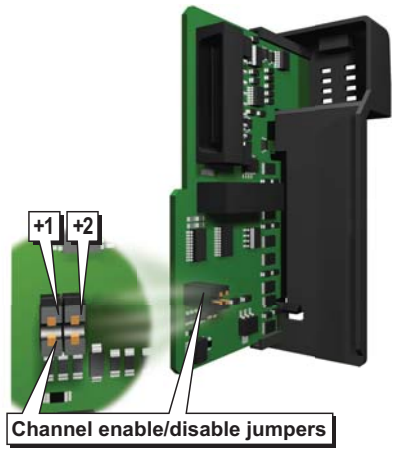
Yes = Jumper Installed No = Jumper Removed

F2-04AD-1(L) Module Jumper Table			
Number of Channels	**Active Channels**	**+1**	**+2**
One	Channel 1	No	No
Two	Channels 1 and 2	Yes	No
Three	Channels 1, 2 and 3	No	Yes
Four	Channels 1, 2, 3 and 4	Yes	Yes



Jumper Location on Modules Having Date Code 0609F3 and Previous

(Two Circuit Board Design)



Jumper Location on Modules Having Date Code 0709G and Above

(Single Circuit Board Design)

F2-04AD-1(L), Analog Input - continued

F2-04AD-1(L) Addressing

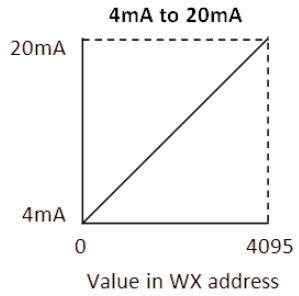
The Do-more CPU module assigns the following memory addresses to this module.

F2-04AD-1(L) X Addressing	
Address	**Description**
Xn	On when the external 24VDC input power is missing or terminal block is removed.
Xn+1	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 2 input is not used)
Xn+2	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 3 input is not used)
Xn+3	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 4 input is not used)
Xn+4	Not used
Xn+5	Not used
Xn+6	Not used
Xn+7	Not used

Xn: Starting X address assigned to this module

F2-04AD-1(L) WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (0 to 4095)
WXn+1	Channel 2 Input Data (0 to 4095)
WXn+2	Channel 3 Input Data (0 to 4095)
WXn+3	Channel 4 Input Data (0 to 4095)

WXn: Starting WX address assigned to this module



F2-04AD-2(L), Analog Input

F2-04AD-2(L) 4-Channel Analog Voltage In	
Number of Channels	4, single ended (1 common)
Input Ranges	0 to 5V, 0 to 10V, ±5V, ±10 VDC
Resolution	12 bit (1 in 4096) uni-polar 13 bit (1 in 8191) bi-polar
Active Low-pass Filtering	-3 dB at 80 Hz, 2 poles (-12 dB per octave)
Input Impedance	>20 MΩ
Absolute Maximum Ratings	-75 to +75 VDC
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	4 channels per scan maximum
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum ±2 counts maximum (bi-polar)
Input Stability	±1 count
Full Scale Calibration Error (not incl. offset error)	±3 counts maximum
Offset Calibration Error	±1 count maximum (0V input)
Step Response	F2-04AD-2: 8.2 ms to 95% of F.S change F2-04AD-2L: 10 ms to 95% of F.S change
Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.3% 32º to 140ºF (0º to 60ºC)
Accuracy vs. Temperature	±50 ppm/ºC full scale calibration change (including maximum offset change)
Base Power Required 5VDC	F2-04AD-2: 110 mA F2-04AD-2L: 60 mA
External Power Supply	F2-04AD-2: 5 mA maximum, +10 to +30 VDC F2-04AD-2L: 90 mA maximum, +10 to +15 VDC
Operating Temperature	32º to 140ºF (0 to 60ºC)
Storage Temperature	-4º to 158°F (-20º to 70ºC)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

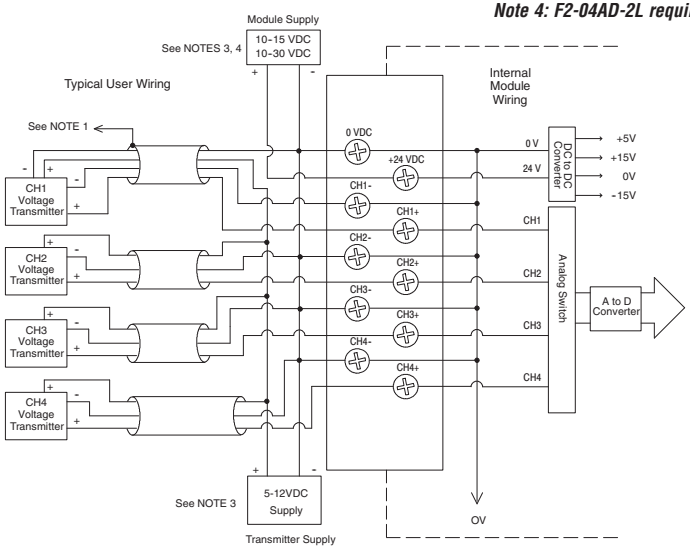
One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

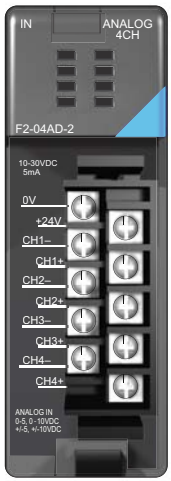
Note 1: Shields should be grounded at the signal source.

Note 2: Unused inputs should be jumpered together (i.e. CH4- to CH4+).

Note 3: More than one external power supply can be used provided the commons are connected together.

Note 4: F2-04AD-2L requires 10-15 VDC input supply.





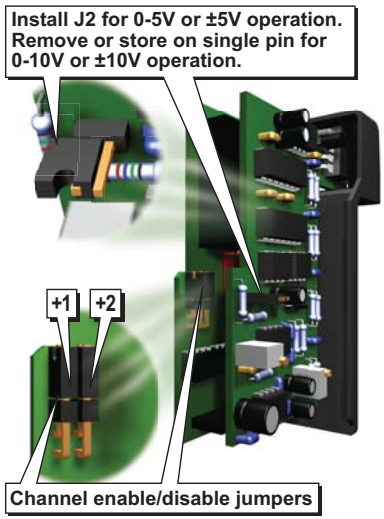
F2-04AD-2(L), Analog Input - continued

Setting the Module Jumpers

There are two channel selection jumpers, labeled +1 and +2, that are used to select the number of channels that will be used. See the figure below to find the jumpers on your module. The module is set from the factory for four channel operation. Any unused channels are not processed, so if you only select channels 1 thru 3, channel 4 will not be active. The following table shows how to use the jumpers to select the number of channels. Unused jumpers can be stored on a single post to prevent losing them.

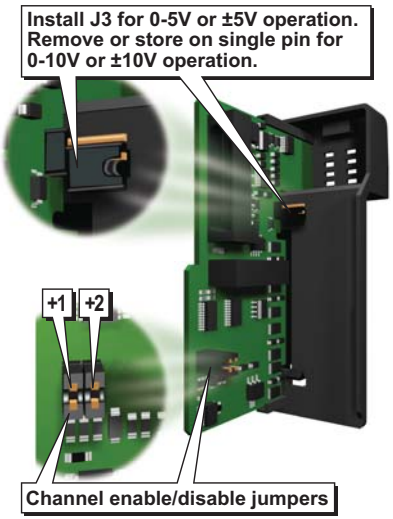
Yes = Jumper Installed No = Jumper Removed

F2-04AD-2(L) Module Jumper Table			
Number of Channels	**Active Channels**	**+1**	**+2**
One	Channel 1	No	No
Two	Channels 1 and 2	Yes	No
Three	Channels 1, 2 and 3	No	Yes
Four	Channels 1, 2, 3 and 4	Yes	Yes



Jumper Location on Modules Having Date Code 0609F3 and Previous

(Two Circuit Board Design)



Jumper Location on Modules Having Date Code 0709G and Above

(Single Circuit Board Design)

As seen above, there is also one input signal range jumper, labeled J2 or J3, that is used to select between the 5V and 10V signal ranges. The module is set from the factory for 10V operation (jumper not installed).

F2-04AD-2(L), Analog Input - continued

F2-04AD-2(L) Addressing

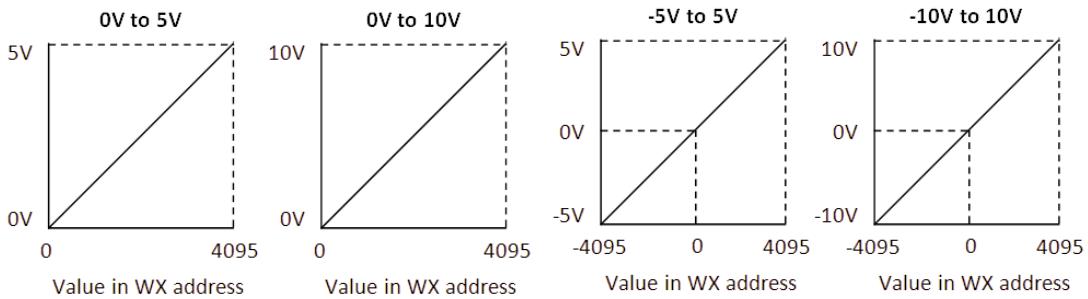
The Do-more CPU module assigns the following memory addresses to this module.

F2-04AD-2(L) X Addressing	
Address	**Description**
Xn	On when the external 24VDC input power is missing or terminal block is removed.
Xn+1	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 2 input is not used)
Xn+2	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 3 input is not used)
Xn+3	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 4 input is not used)
Xn+4	Not used
Xn+5	Not used
Xn+6	Not used
Xn+7	Not used

Xn: Starting X address assigned to this module

F2-04AD-2(L) WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (0 to 4095 or -4095 to 4095)
WXn+1	Channel 2 Input Data (0 to 4095 or -4095 to 4095)
WXn+2	Channel 3 Input Data (0 to 4095 or -4095 to 4095)
WXn+3	Channel 4 Input Data (0 to 4095 or -4095 to 4095)

WXn: Starting WX address assigned to this module



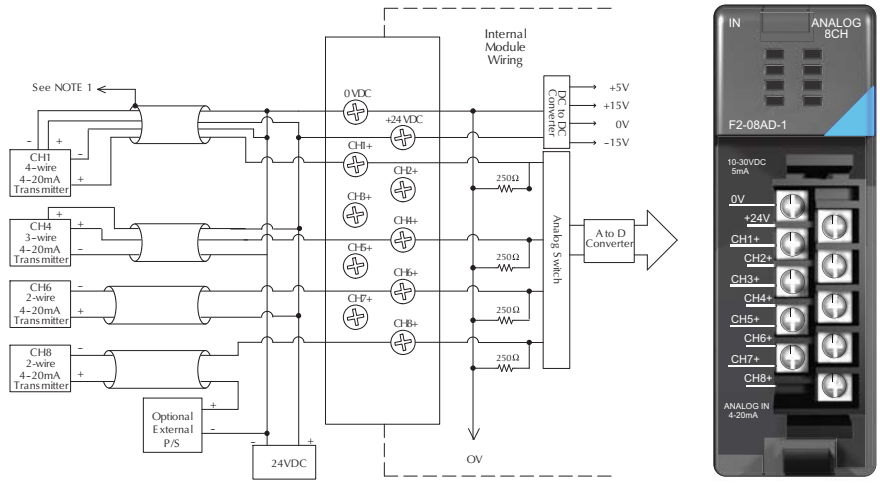
F2-08AD-1, Analog Input

F2-08AD-1 8-Channel Analog Current In	
Number of Channels	8, single ended (1 common)
Input Ranges	4 to 20 mA current
Resolution	12 bit (1 in 4096)
Low-pass Filtering	-3 dB at 200 Hz, (-6 dB per octave)
Input Impedance	250Ω ±0.1%, 1/2W current input
Absolute Maximum Ratings	-45 mA to +45 mA
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	8 channels per scan maximum
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum
Input Stability	±1 count
Full Scale Calibration Error (not incl. offset error)	±5 counts max., @ 20 mA current input
Offset Calibration Error	±2 counts max., @ 4mA current input
Step Response	1 ms to 95% of F.S. change
Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.25% 32º to 140ºF (0º to 60ºC)
Accuracy vs. Temperature	±50 ppm/ºC maximum full scale (including max. offset change of two counts)

Recommended Fuse	0.032A, Series 217 fast-acting, current inputs
Base Power Required 5VDC	100 mA
External Power Supply	5 mA maximum, +10 to +30 VDC
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

Note 1: Shields should be grounded at the signal source.



More than one external power supply can be used provided all the power supply commons are connected. A Series 217, 0.032A, fast-acting fuse is recommended for 4-20 mA current loops. If the power supply common of an external power supply is not connected to 0 VDC on the module, then the output of the external transmitter must be isolated. To avoid "ground loop" errors, recommended 4-20 mA transmitter types are: 2 or 3 wire - Isolation between input signal and power supply or 4 wire - Isolation between input signal, power supply, and 4-20 mA output

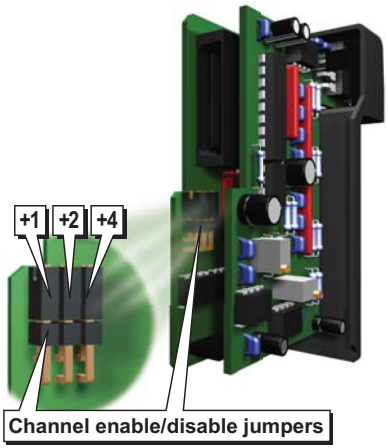
F2-08AD-1, Analog Input - continued

Setting the Module Jumpers

There are three channel selection jumpers, labeled +1, +2, and +4, that are used to select the number of channels that will be used. See the figure below to find the jumpers on your module. The module is set from the factory for eight channel operation (all three jumpers installed). Any unused channels are not processed, so if you only select channels 1 thru 3, channels 4 thru eight will not be active. The following table shows how to use the jumpers to select the number of channels. Unused jumpers can be stored on a single post to prevent losing them.

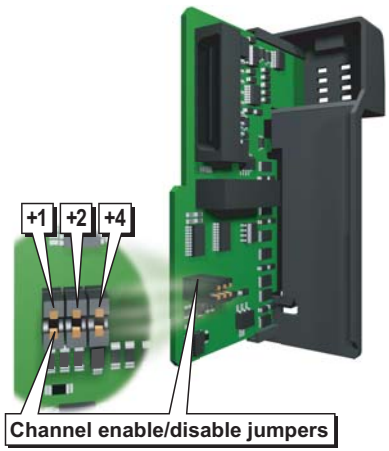
Yes = Jumper Installed No = Jumper Removed

F2-08AD-1 Module Jumper Table				
Number of Channels	**Active Channels**	**+1**	**+2**	**+4**
One	Channel 1	No	No	No
Two	Channels 1 - 2	Yes	No	No
Three	Channels 1 - 3	No	Yes	No
Four	Channels 1 - 4	Yes	Yes	No
Five	Channels 1 - 5	No	No	Yes
Six	Channels 1 - 6	Yes	No	Yes
Seven	Channels 1 - 7	No	Yes	Yes
Eight	Channels 1 - 8	Yes	Yes	Yes



Jumper Location on Modules Having Date Code 0609B5 and Previous

(Two Circuit Board Design)



Jumper Location on Modules Having Date Code 0709C1 and Above

(Single Circuit Board Design)

F2-08AD-1, Analog Input - continued

F2-08AD-1 Addressing

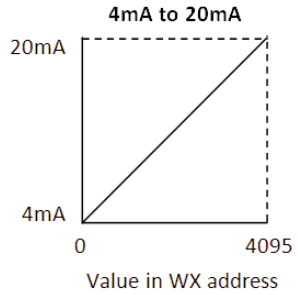
The Do-more CPU module assigns the following memory addresses to this module.

F2-08AD-1 X Addressing	
Address	**Description**
Xn	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+1	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 2 input is not used)
Xn+2	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 3 input is not used)
Xn+3	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 4 input is not used)
Xn+4	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 5 input is not used)
Xn+5	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 6 input is not used)
Xn+6	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 7 input is not used)
Xn+7	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 8 input is not used)

Xn: Starting X address assigned to this module

F2-08AD-1 WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (0 to 4095)
WXn+1	Channel 2 Input Data (0 to 4095)
WXn+2	Channel 3 Input Data (0 to 4095)
WXn+3	Channel 4 Input Data (0 to 4095)
WXn+4	Channel 5 Input Data (0 to 4095)
WXn+5	Channel 6 Input Data (0 to 4095)
WXn+6	Channel 7 Input Data (0 to 4095)
WXn+7	Channel 8 Input Data (0 to 4095)

WXn: Starting WX address assigned to this module



F2-08AD-2, Analog Input

F2-08AD-2 8-Channel Analog Voltage In	
Number of Channels	8, single ended (1 common)
Input Ranges	0 to 5V, 0 to 10V, ±5V, ±10 VDC
Resolution	12 bit (1 in 4096) uni-polar 13 bit (1 in 8191) bi-polar
Active Low-pass Filtering	-3 dB at 200 Hz, (-6 dB per octave)
Input Impedance	>20 MΩ
Absolute Maximum Ratings	-75 to +75 VDC
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	8 channels per scan maximum
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum
Input Stability	±1 count
Full Scale Calibration Error (not incl. offset error)	±3 counts maximum
Offset Calibration Error	±1 count maximum (0V input)
Step Response	1 ms to 95% of F.S. change
Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.3% 32º to 140ºF (0º to 60ºC)
Accuracy vs. Temperature	±50 ppm/ºC maximum full scale (including max. offset change of 2 counts)

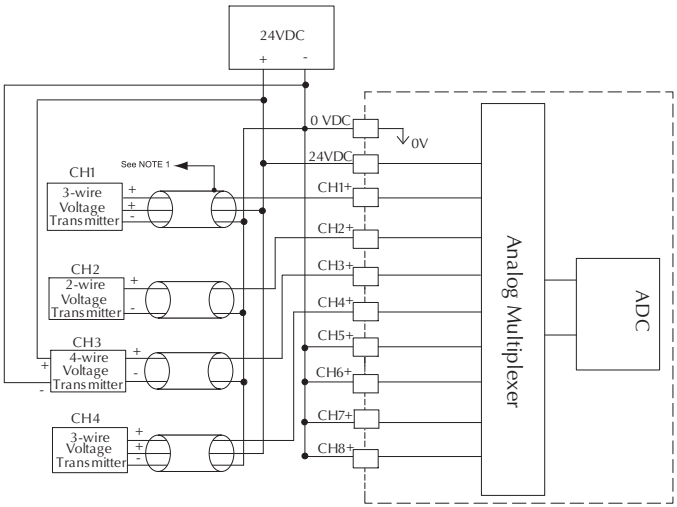
Base Power Required 5VDC	100 mA
External Power Supply	5 mA maximum, +10 to +30 VDC
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096). Includes circuitry to automatically detect broken or open transmitters.

Note 1: Shields should be grounded at the signal source.

Note 2: Connect all external power supply commons.

Note 3: Connect unused channels (CH5+, CH6+, CH7+, CH8+ in this example) to 0VDC.



6

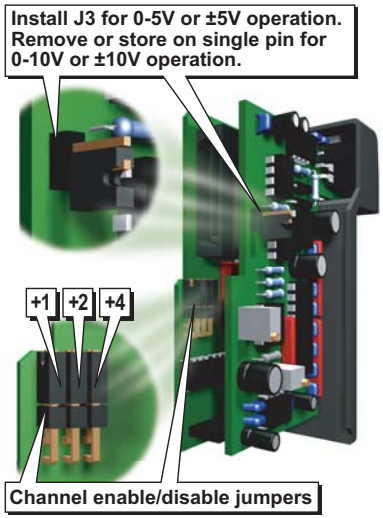
F2-08AD-2, Analog Input - continued

Setting the Module Jumpers

There are three channel selection jumpers, labeled +1, +2, and +4, that are used to select the number of channels that will be used. See the figure below to find the jumpers on your module. The module is set from the factory for eight channel operation (all three jumpers installed). Any unused channels are not processed, so if you only select channels 1 thru 3, channels 4 thru eight will not be active. The following table shows how to use the jumpers to select the number of channels. Unused jumpers can be stored on a single post to prevent losing them.

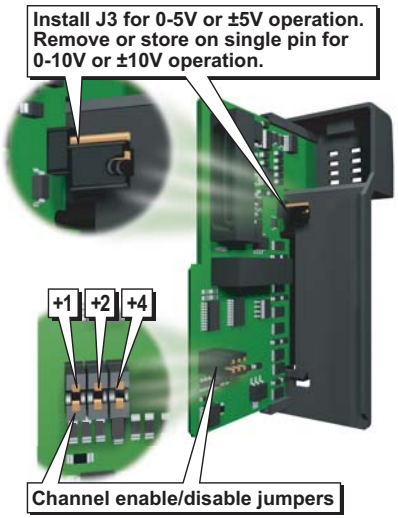
Yes = Jumper Installed No = Jumper Removed

F2-08AD-2 Module Jumper Table				
Number of Channels	**Active Channels**	**+1**	**+2**	**+4**
One	Channel 1	No	No	No
Two	Channels 1 - 2	Yes	No	No
Three	Channels 1 - 3	No	Yes	No
Four	Channels 1 - 4	Yes	Yes	No
Five	Channels 1 - 5	No	No	Yes
Six	Channels 1 - 6	Yes	No	Yes
Seven	Channels 1 - 7	No	Yes	Yes
Eight	Channels 1 - 8	Yes	Yes	Yes



Jumper Location on Modules Having Date Code 0609D4 and Previous

(Two Circuit Board Design)



Jumper Location on Modules Having Date Code 0709E1 and Above

(Single Circuit Board Design)

As seen above, there is another jumper labeled J3 that is used to select between the 5V and 10V signal ranges. The module is set from the factory for 10V operation (jumper not installed).

F2-08AD-2, Analog Input - continued

F2-08AD-2 Addressing

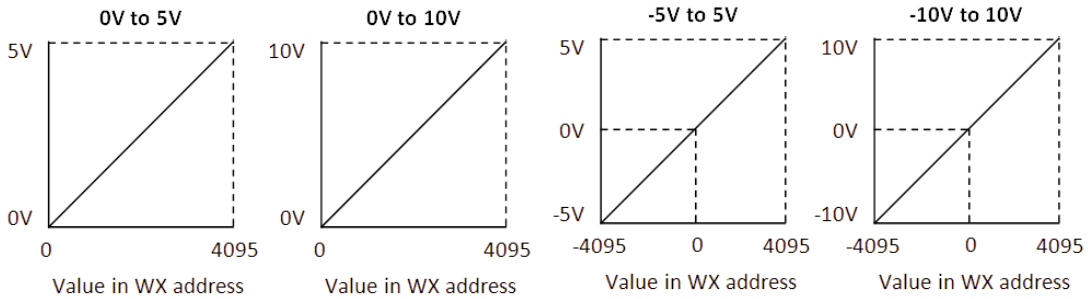
The Do-more CPU module assigns the following memory addresses to this module.

F2-08AD-2 X Addressing	
Address	**Description**
Xn	On when the external 24VDC input power is missing or terminal block is removed.
Xn+1	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 2 input is not used)
Xn+2	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 3 input is not used)
Xn+3	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 4 input is not used)
Xn+4	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 5 input is not used)
Xn+5	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 6 input is not used)
Xn+6	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 7 input is not used)
Xn+7	On when the external 24VDC input power is missing or terminal block is removed. (This address stays off if Channel 8 input is not used)

Xn: Starting X address assigned to this module

F2-08AD-2 WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (0 to 4095 or -4095 to 4095)
WXn+1	Channel 2 Input Data (0 to 4095 or -4095 to 4095)
WXn+2	Channel 3 Input Data (0 to 4095 or -4095 to 4095)
WXn+3	Channel 4 Input Data (0 to 4095 or -4095 to 4095)
WXn+4	Channel 5 Input Data (0 to 4095 or -4095 to 4095)
WXn+5	Channel 6 Input Data (0 to 4095 or -4095 to 4095)
WXn+6	Channel 7 Input Data (0 to 4095 or -4095 to 4095)
WXn+7	Channel 8 Input Data (0 to 4095 or -4095 to 4095)

WXn: Starting WX address assigned to this module



F2-04RTD

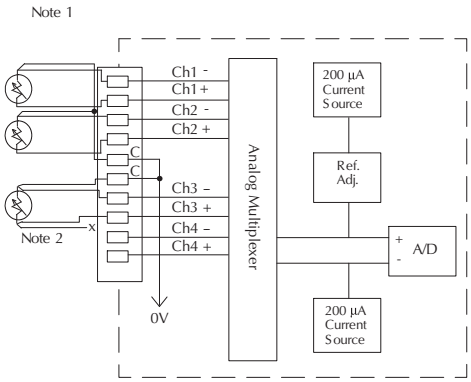
F2-04RTD 4-Channel RTD	
Number of Channels	4
Input Ranges	Type Pt100: -200.0 to 850.0°C, -328.0 to 1562.0°F Type Pt1000: -200.0 to 595.0°C, -328.0 to 1103.0°F Type jPt100: -38.0 to 450.0°C, -36.0 to 842.0°F Type CU-10/25Ω: -200.0 to 260.0°C, -328.0 to 500.0°F
Resolution	16 bit (1 in 65535)
Display Resolution	±0.1°C, ±0.1°F (±3276.7)
RTD Excitation Current	200 µA
Input Type	Differential
Notch Filter	>100 db notches at 50/60 Hz -3 db =13.1Hz
Maximum Setting Time	100 ms (full-scale step input)
Common Mode Range	0-5 VDC
Absolute Maximum Ratings	Fault protected inputs to ±50 VDC
Sampling Rate	160 ms per channel

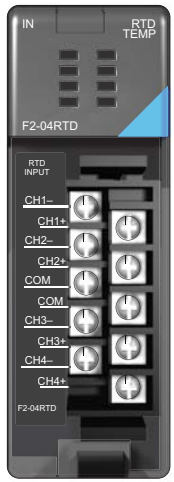
Converter Type	Charge Balancing
Linearity Error	±.05°C maximum, ±.01°C typical
Maximum Inaccuracy	±1°C
PLC Update Rate	4 channels per scan maximum
Base Power Required 5VDC	90 mA
Operating Temperature	32° to 140°F (0° to 60°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Temperature Drift	None (self-calibrating)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON

Note 1. The three wires connecting the RTD to the module must be the same type and length. Do not use the shield or drain wire for the third connection.

Note 2. If an RTD sensor has four wires, the plus sense wire should be left unconnected as shown.

Note 3. This module is not compatible with the ZIPLink wiring systems.



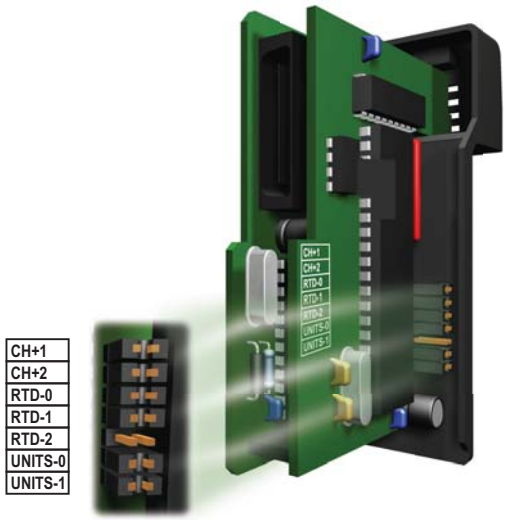


F2-04RTD - continued

Setting the Module Jumpers

There are seven jumpers (J8) located on the PC board of this module. The description of each jumper's function is also located on the PC board. These jumpers configure the module for the following options:

- Number of channels: 1 thru 4.
- The input type: 10Ω or 25Ω copper RTDs; jPt 100Ω, Pt 100Ω or Pt 1000 Ω RTDs.
- Temperature conversion: 2's complement or magnitude + sign format in Fahrenheit or Celcius.



There are two channel selection jumpers, labeled CH+1 and CH+2, that are used to select the number of channels that will be used. The module is set from the factory for four channel operation. Any unused channels are not processed, so if you only select channels 1 thru 3, channel 4 will not be active. The following table shows how to use the jumpers to select the number of channels. Unused jumpers can be stored on a single post to prevent losing them.

Yes = Jumper Installed No = Jumper Removed

F2-04RTD Module Jumper Table (Channel)			
Number of Channels	**Active Channels**	**CH+1**	**CH+2**
One	Channel 1	No	No
Two	Channels 1 and 2	Yes	No
Three	Channels 1, 2 and 3	No	Yes
Four	Channels 1, 2, 3 and 4	Yes	Yes

F2-04RTD - continued

The jumpers labeled RTD-0, RTD-1, and RTD-2 are used to select the type of RTD.The module can be used with many types of RTDs. All channels of the module must be the same RTD type.

The default setting from the factory is Pt100Ω (RTD-2 comes with the jumper removed). This selects the DIN43760 European type RTD. European curve type RTDs are calibrated to DIN43760, BS1905, or IEC751 specifications which is .00385Ω/Ω/°C(100°C = 138.5Ω).

The jPt100Ω type is used for the American curve (.00392Ω/Ω/°C), platinum 100Ω RTDs. The 10Ω and 25Ω RTD settings are used with copper RTDs.

The following table shows how to arrange the jumpers to set the different input types.

Yes = Jumper Installed No = Jumper Removed

F2-04RTD Module Jumper Table (Input Type)			
RTD Inputs	RTD-0	RTD-1	RTD-2
CU 10Ω	No	No	No
CU 25Ω	Yes	No	No
jPt 100Ω	No	Yes	No
Pt 100Ω	Yes	Yes	No
Pt 1000Ω	No	No	Yes

The last two jumpers, Units-0 and Units-1, are used to set the conversion unit. The options are magnitude + sign or 2's complement in Fahrenheit or Celsius. The module comes from the factory with both jumpers installed for magnitude + sign conversion in Fahrenheit.

All RTD types are converted into a direct temperature reading in either Fahrenheit or Celsius. The data contains one implied decimal place. For example, a value in WX memory of 1002 would be 100.2°C or °F.

Negative temperatures can be represented in either 2's complement or magnitude + sign form. If the temperature is negative, the most significant bit in the WX memory location is set.

The 2's complement data format may be required to correctly display bipolar data on some operator interfaces. This data format could also be used to simplify averaging a bipolar signal. To view this data format in the Do-more Designer software, select Signed Decimal.

The following table shows how to arrange the jumpers to set the different conversion units.

Yes = Jumper Installed No = Jumper Removed

F2-04RTD Module Jumper Table (Temperature Conversion Unit)		
Temperature Conversion Units	Units-0	Units-1
Magnitude + Sign (°F)	Yes	Yes
Magnitude + Sign (°C)	No	Yes
2's Complement (°F)	Yes	No
2's Complement (°C)	No	No

F2-04RTD - continued

F2-04RTD Addressing

The Do-more CPU module assigns the following memory addresses to this module.

F2-04RTD X Addressing	
Address	**Description**
Xn	On when the RTD is open or terminal block is removed.
Xn+1	On when the RTD is open or terminal block is removed. (This address stays off if Channel 2 input is not used)
Xn+2	On when the RTD is open or terminal block is removed. (This address stays off if Channel 3 input is not used)
Xn+3	On when the RTD is open or terminal block is removed. (This address stays off if Channel 4 input is not used)
Xn+4	Not used
Xn+5	Not used
Xn+6	Not used
Xn+7	Not used

Xn: Starting X address assigned to this module

F2-04RTD WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (Temperature [Unit: 0.1 degree])
WXn+1	Channel 2 Input Data (Temperature [Unit: 0.1 degree])
WXn+2	Channel 3 Input Data (Temperature [Unit: 0.1 degree])
WXn+3	Channel 4 Input Data (Temperature [Unit: 0.1 degree])

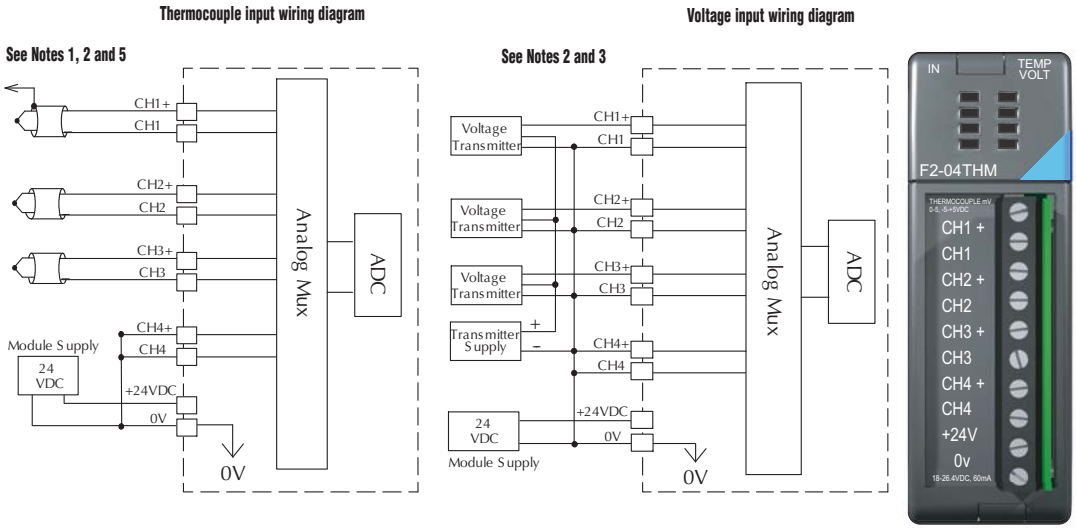
WXn: Starting WX address assigned to this module

F2-04THM

F2-04THM 4-Channel Thermocouple	
General Specifications	
Number of Channels	4, differential
Common Mode Range	±5 VDC
Common Mode Rejection	90 dB min. @ DC, 150 dB min. @ 50/60 Hz.
Input Impedance	1 MΩ
Absolute Maximum Ratings	Fault-protected inputs to ±50 VDC
Accuracy vs. Temperature	±5 ppm/°C maximum full scale calibration (including maximum offset change)
PLC Update Rate	4 channels per scan maximum
External Power Supply	60 mA maximum, 18 to 26.4 VDC
Base Power Required 5VDC	110 mA
Operating Temperature	32° to 140°F (0° to 60°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Non-removable

Thermocouple Specifications		
Input Ranges	Type J -190 to 760°C Type E -210 to 1000°C Type K -150 to 1372°C Type R 65 to 1768°C Type S 65 to 1768°C Type T -230 to 400°C Type B 529 to 1820°C Type N -70 to 1300°C Type C 65 to 2320°C	-310 to 1400°F -346 to 1832°F -238 to 2502°F 149 to 3214°F 149 to 3214°F -382 to 752°F 984 to 3308°F -94 to 2372°F 149 to 4208°F
Display Resolution	±0.1°C or ±0.1°F	
Cold Junction Compensation	Automatic	
Conversion Time	100 ms per channel	
Warm-Up Time	30 minutes typically ± 1°C repeatability	
Linearity Error (End to End)	±.05°C maximum, ±.01°C typical	
Maximum Inaccuracy	±3°C (excluding thermocouple error)	
Voltage Input Specifications		
Voltage Ranges	0-5V, ±5V, 0-156.25 mV, ±156.25 mVDC	
Resolution	16 bit (1 in 65535)	
Full Scale Calibration Error (not incl. offset error)	±13 counts typical ±33 maximum	
Offset Calibration Error	±1 count maximum, @ 0V input	
Linearity Error (End to End)	±1 count maximum	
Maximum Inaccuracy	±.02% @ 25°C (77°F)	

F2-04THM - continued



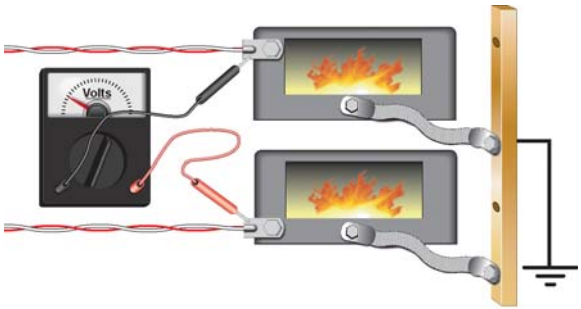
Note 1: Terminate shields at the respective signal source.

Note 2: Connect unused channels to a common terminal (0V, CH4+, CH4).

Note 3: When using 0-156 mV and 5V ranges, connect (-) or (0) volts terminal to 0V to ensure common mode range acceptance.

Note 4. This module is not compatible with the ZIPLink wiring system.

Note 5. With grounded thermocouples, take precautions to prevent having a voltage potential between thermocouple tips. A voltage of 5V or greater between tips will skew measurements.



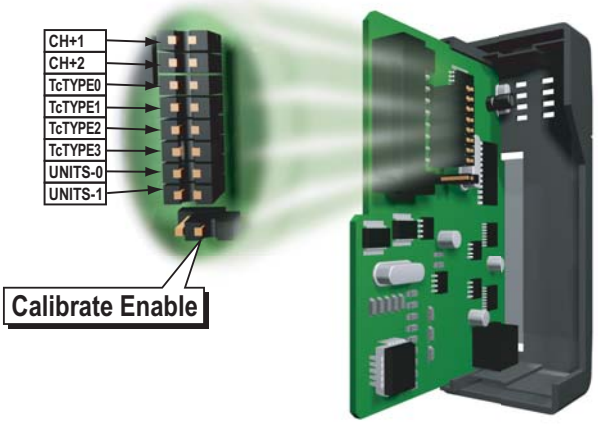
F2-04THM - continued

Setting the Module Jumpers

There are eight jumpers (J7) and one single jumper (J9) located on the PC board of this module. These jumpers configure the module for the following options:

- Number of channels
- Input type
- Thermocouple or Voltage conversion units
- Calibrate enable

Jumper Location on Modules Having Two Circuit Board Design



Jumper Location on Modules Having Single Circuit Board Design

There are two channel selection jumpers, labeled CH+1 and CH+2, that are used to select the number of channels that will be used. The module is set from the factory for four channel operation. Any unused channels are not processed. The following table shows how to use the jumpers to select the number of channels. Unused jumpers can be stored on a single post to prevent losing them.

Yes = Jumper Installed No = Jumper Removed

F2-04THM Module Jumper Table (Channel)			
Number of Channels	**Active Channels**	**CH+1**	**CH+2**
One	Channel 1	No	No
Two	Channels 1 and 2	Yes	No
Three	Channels 1, 2 and 3	No	Yes
Four	Channels 1, 2, 3 and 4	Yes	Yes

F2-04THM - continued

The jumpers labeled Tc Type 0, Tc Type 1, Tc Type 2, and Tc Type 3 must be set to match the type of thermocouple being used or the input voltage level. This module can be used with many types of thermocouples, so use the following table to determine your settings.

This module comes from the factory with all four jumpers installed for use with a J type thermocouple. For example, to use an S type thermocouple, remove the jumper labeled Tc Type 2. All channels of the module must be the same thermocouple type or input voltage level.

Yes = Jumper Installed No = Jumper Removed

F2-04THM Module Jumper Table (Input Type)				
Thermocouple/ Voltage Level	**TC Type 0**	**TC Type 1**	**TC Type 2**	**TC Type 3**
J	Yes	Yes	Yes	Yes
K	No	Yes	Yes	Yes
E	Yes	No	Yes	Yes
R	No	No	Yes	Yes
R Wide*	No	Yes	No	No
S	Yes	Yes	No	Yes
T	No	Yes	No	Yes
B	Yes	No	No	Yes
N	No	No	No	Yes
C	Yes	Yes	Yes	No
0 -5V	No	Yes	Yes	No
±5V	Yes	No	Yes	No
0 - 156 mV	No	No	Yes	No
±156 mV	Yes	Yes	No	No

**** R Wide range is available only on modules with date code 0410E2 and later***

Units-0 and Units-1 jumpers are used to set the conversion unit for either thermocouple or voltage inputs. The options are magnitude + sign or 2's complement in Fahrenheit or Celsius.

All thermocouple types are converted into a direct temperature reading in either Fahrenheit or Celsius. The data contains one implied decimal place. For example, a value in WX memory of 1002 would be 100.2°C or °F.

For thermocouple ranges which include negative temperatures (J,E,K,T,N), the display resolution is from -3276.7 to +3276.7. For positive-only thermocouple ranges (R,S,B,C), the display resolution is 0 to 6553.5.

Negative temperatures can be represented in either 2's complement or magnitude + sign form. If the temperature is negative, the most significant bit in the WX memory location is set.

F2-04THM - continued

The 2's complement data format may be required to correctly display bipolar data on some operator interfaces. This data format could also be used to simplify averaging a bipolar signal. To view this data format in the Do-more software, select Signed Decimal.

For unipolar thermocouple ranges (R,S,B,C), it does not matter if magnitude + sign or 2's complement is selected.

This module comes with both jumpers installed for magnitude + sign conversion in Fahrenheit. Use the following table to select temperature conversion unit. For example, remove the Units-0 jumper and leave the Units-1 jumper installed for magnitude + sign conversion in Celsius.

Yes = Jumper Installed No = Jumper Removed

F2-04THM Module Jumper Table (Temperature Conversion Unit)		
Temperature Conversion Units	**Units-0**	**Units-1**
Magnitude + Sign (°F)	Yes	Yes
Magnitude + Sign (°C)	No	Yes
2's Complement (°F)	Yes	No
2's Complement (°C)	No	No

The bipolar voltage input ranges, ±5V or ±156mV (see previous page for ±5V and ±156mV input settings), may be converted to a 15-bit magnitude + sign or a 16-bit 2's complement value.

This module comes with both jumpers installed for magnitude ± sign conversion. Use the following table to select voltage conversion unit. For Example, remove the Units-1 jumper and leave the Units-0 jumper installed for 2's complement conversion.

Yes = Jumper Installed No = Jumper Removed

F2-04THM Module Jumper Table (Voltage Conversion Unit)		
Voltage Conversion Units	**Units-0**	**Units-1**
Magnitude + Sign	Yes	Yes
2's Complement	Yes	No

The Calibrate Enable jumper J9 comes from the factory in the "jumper removed" setting (the jumper is installed over only one of the two pins). Installing this jumper disables the thermocouple active burn-out detection circuitry, which enables you to attach a thermocouple calibrator to the module. To make sure that the output of the thermocouple calibrator is within the 5V common mode voltage range of the module, connect the negative side of the differential voltage input channel to the 0V terminal, then connect the thermocouple calibrator to the differential inputs (for example, Ch 3+ and Ch 3).

For the voltage input ranges, this jumper is inactive and can be installed or removed with no effect on voltage input.

F2-04THM - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-04THM X Addressing	
Address	**Description**
Xn	On when the thermocouple is open or the external 24VDC input power is missing.
Xn+1	On when the thermocouple is open or the external 24VDC input power is missing. (This address stays off if Channel 2 input is not used)
Xn+2	On when the thermocouple is open or the external 24VDC input power is missing. (This address stays off if Channel 3 input is not used)
Xn+3	On when the thermocouple is open or the external 24VDC input power is missing. (This address stays off if Channel 4 input is not used)
Xn+4	Not used
Xn+5	Not used
Xn+6	Not used
Xn+7	Not used

Xn: Starting X address assigned to this module

F2-04THM WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (Temperature [Unit: 0.1 degree] or Voltage [0 to 65535[1]])
WXn+1	Channel 2 Input Data (Temperature [Unit: 0.1 degree] or Voltage [0 to 65535[1]])
WXn+2	Channel 3 Input Data (Temperature [Unit: 0.1 degree] or Voltage [0 to 65535[1]])
WXn+3	Channel 4 Input Data (Temperature [Unit: 0.1 degree] or Voltage [0 to 65535[1]])

WXn: Starting WX address assigned to this module

NOTE 1: *The data format of the WX addresses is 'Signed Word'. They store -32768 to 32767 as default. To read and write 0 to 65535 into these memory addresses, use the casting ':U'. (':U' is the casting for 'Unsigned' format.) For instance, if you selected the voltage input for the first analog input channel and WX0 is assigned to the channel, use 'WX0:U' to access this memory address in the ladder program and other tools in Do-more Designer.*

F2-02DA-1(L), Analog Output

F2-02DA-1(L) 2-Channel Analog Current Output	
Number of Channels	2
Output Ranges	4 to 20 mA
Resolution	12 bit (1 in 4096)
Output Type	Single ended, 1 common
Maximum Loop Supply	30 VDC
Peak Output Voltage	40 VDC (clamped by transient voltage suppressor)
Load Impedance	0Ω minimum
Maximum Load/Power Supply	620Ω/18V, 910Ω/24V, 1200Ω/30V
PLC Update Rate	2 channels per scan maximum
Linearity Error (end to end)	±1 count (0.025% of full scale) maximum
Conversion Settling Time	100 µs maximum (full scale change)
Full Scale Calibration Error (not incl. offset error)	±5 counts max., 20 mA @ 77°F (25°C)
Offset Calibration Error	±3 counts max., 4mA @ 77°F (25°C)
Accuracy vs. Temperature	±50 ppm/°C full scale calibration change (including maximum offset change of 2 counts)
Maximum Inaccuracy	+0.1% @ 77°F (25°C) ±0.3% @ 32 to 140°F (0 to 60°C)

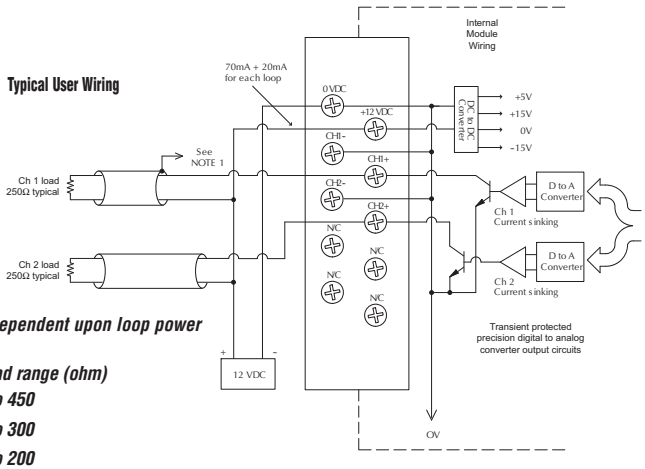
Base Power Required 5VDC	40 mA
External Power Supply	F2-02DA-1:18 to 30 VDC, 60 mA F2-02DA-1L: 10 to 15 VDC, 70 mA (add 20 mA for each current loop used)
Operating Temperature	32° to 140°F (0° to 60°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

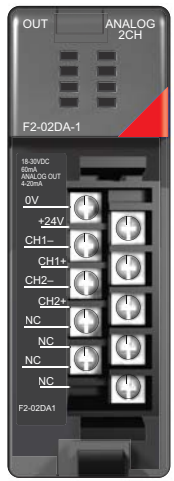
One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

Note 1: Shields should be connected to the 0V of the module or the 0V of the P/S.

Note 2: Unused voltage outputs should remain open (no connections) for minimum power consumption.

Typical User Wiring





Maximum user load is dependent upon loop power supply.

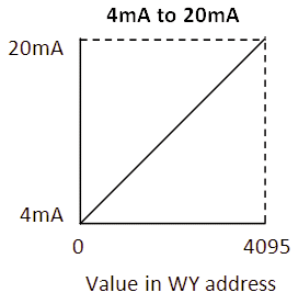
Loop power supply	Load range (ohm)
15 VDC	0 to 450
12 VDC	0 to 300
10 VDC	0 to 200

F2-02DA-1(L), Analog Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-02DA-1(L) WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 4095)
WYn+1	Channel 2 Output Data (0 to 4095)

WYn: Starting WY address assigned to this module



F2-02DA-2(L), Analog Output

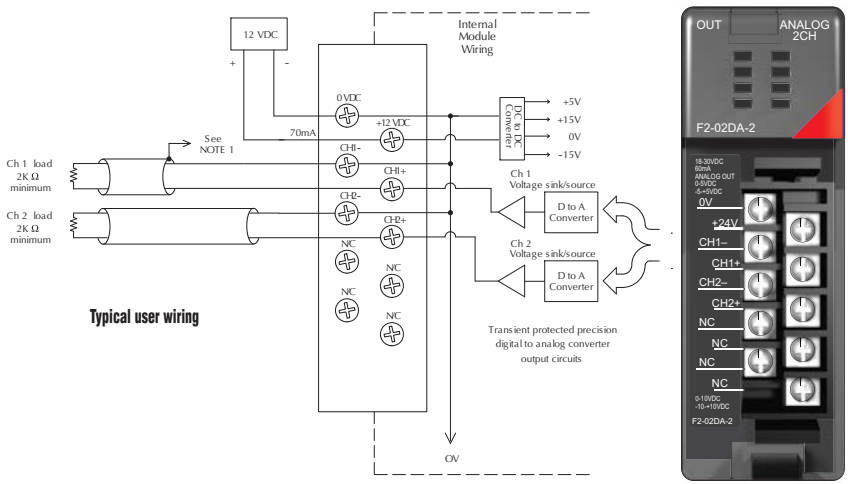
F2-02DA-2(L) 2-Channel Analog Voltage Output	
Number of Channels	2
Output Ranges	0 to 5V, 0 to 10V, ±5V, ±10V
Resolution	12 bit (1 in 4096)
Output Type	Single ended, 1 common
Peak Output Voltage	15 VDC (clamped by transient voltage suppressor)
Load Impedance	2000 Ω minimum
Load Capacitance	.01 µF maximum
PLC Update Rate	2 channels per scan maximum
Linearity Error (end to end)	±1 count (0.025% of full scale) maximum
Conversion Settling Time	5 µs maximum (full scale change)
Full Scale Calibration Error (not incl. offset error)	±12 counts max. unipolar @ 77ºF (25ºC) ±16 counts max. bipolar @ 77ºF (25ºC)
Offset Calibration Error	±3 counts max., unipolar @ 77ºF (25ºC) ±8 counts max., bipolar @ 77ºF (25ºC)
Accuracy vs. Temperature	±50 ppm/ºC full scale calibration change (including maximum offset change of 2 counts)
Maximum Inaccuracy	+0.3% unipolar ranges @ 77ºF (25ºC) ±0.45% unipolar ranges >77ºF (25ºC) ±0.4% bipolar ranges @77ºF (25ºC) ±0.55% bipolar ranges >77ºF (25ºC)

Base Power Required 5VDC	40 mA
External Power Supply	F2-02DA-2: 18 to 30 VDC, 60 mA (outputs fully loaded) F2-02DA-2L: 10 to 15 VDC, 70 mA (outputs fully loaded)
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

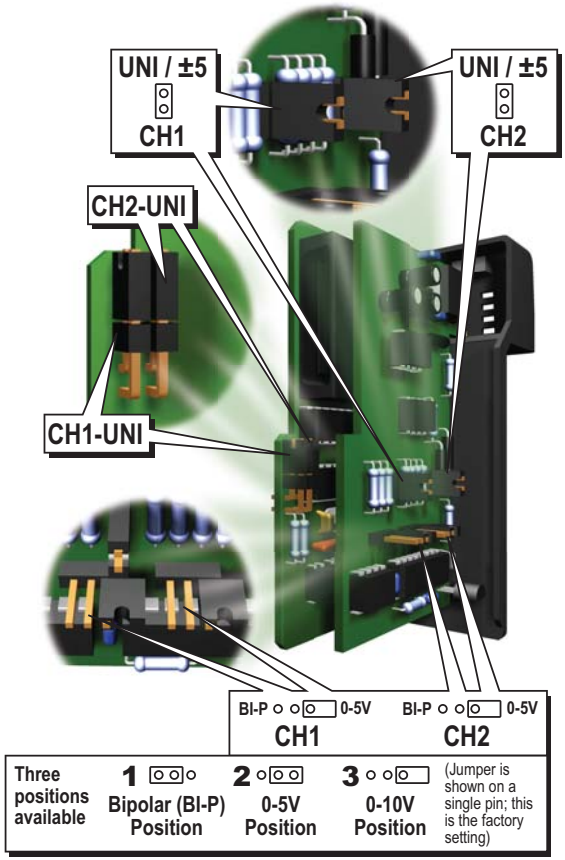
Note1: Shields should be connected to the 0V of the module or the 0V of the P/S.

Note 2: Unused voltage outputs should remain open (no connections) for minimum power consumption.



F2-02DA-2(L), Analog Output - continued

The F2-02DA-2(L) Analog Output module uses jumpers for selecting the voltage ranges for each channel. The range of each channel can be independently set. Available operating ranges are 0-5V, 0-10V, ±5V, and ±10V. There are three jumpers for each channel. Two sets are on the top board, and the third set is along the edge of the bottom board with the black D-shell backplane connector. Install or remove these jumpers to select the desired range.



- Two of the top board jumpers are labeled "UNI/±5" and there is one for each channel. These jumpers are used in conjunction with the "BI-P 0-5" jumpers to determine output voltage polarity and range.
- The two bottom board jumpers are labeled "UNI" and there is one for each channel. These jumpers determine the format of the channel output data, and the effect of their settings is independent from that of the other jumpers on the module. With a UNI jumper removed, the corresponding channel requires data values in the range of ±2047. With a UNI jumper installed, the channel requires data values in the range of 0 to 4095.
- The other two top board jumpers are labeled "BI-P 0-5" and there is one for each channel. These jumpers are used in conjunction with the "UNI/±5" jumpers to determine output voltage polarity and range.

NOTE: *It is important to set the module jumpers correctly. The module will not operate correctly if the jumpers are not properly set for the desired voltage range.*

F2-02DA-2(L), Analog Output - continued

The table below lists the eight possible combinations of voltage ranges and data formats along with their corresponding jumper settings. For most applications, use one of the four standard selections shown in the shaded blocks in the table. Standard unipolar voltage ranges accept a data format of 0 to 4095. Standard bipolar ranges accept a data format of -2047 to +2047. Unused jumpers can be stored on a single post to prevent losing them.

Yes = Jumper Installed No = Jumper Removed

F2-02DA-2(L) Module Jumper Table					
Voltage Range	*Output Data Format*	UNI/±5V (top board)	UNI (bottom board)	BI-P 0-5V (top board)	
				BI-P (Bipolar) Position	0-5V Position
0 to 5V	*0 to 4095*	Yes	Yes	No	Yes
0 to 10V	*0 to 4095*	Yes	Yes	No	No
0 to 5V	*±2047*	Yes	No	No	Yes
0 to 10V	*±2047*	Yes	No	No	No
±5V	*±2047*	Yes	No	Yes	No
±10V	*±2047*	No	No	Yes	No
±5V	*0 to 4095*	Yes	Yes	Yes	No
±10V	*0 to 4095*	No	Yes	Yes	No

For example, to select settings of "±5V" voltage range with a "±2047" output data format for channel 1, refer to the table above and the figure on the previous page and arrange the jumpers as follows:

- Install the "CH1" "UNI/±5V" jumper.
- Remove the "CH1-UNI" jumper. Store the jumper so it does not get lost by placing it on one pin.
- Install the "CH1" "BI-P 0-5" jumper in the BI-P (bipolar) position on the left and center pins.

The non-standard selections in the table provide the opposite data format for both unipolar and bipolar voltage ranges. If you are using unipolar output (0-5V or 0-10V) on one channel and bipolar output (±5V, ±10V) on the other channel, then one of the outputs will use a non-standard data format.

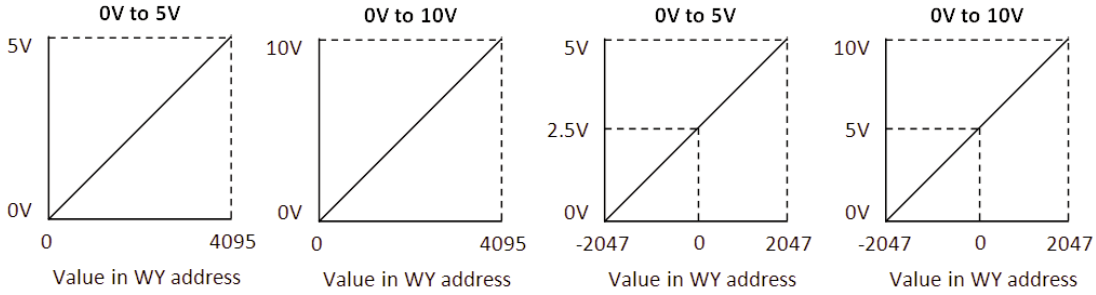
F2-02DA-2(L), Analog Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

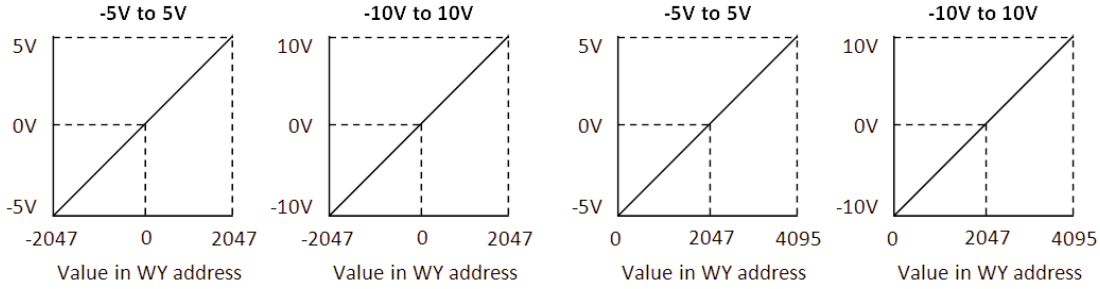
F2-02DA-2(L) WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 4095 or -2047 to 2047)
WYn+1	Channel 2 Output Data (0 to 4095 or -2047 to 2047)

WYn: Starting WY address assigned to this module

Unipolar Ranges



Bipolar Ranges



F2-02DAS-1, Analog Output

F2-02DAS-1 2-Channel Isolated Analog Current Output	
Number of Channels	2, isolated
Output Ranges	4 to 20 mA
Resolution	16 bit (1 in 65536)
Output Type	Current sourcing
Isolation Voltage	±750V continuous, channel to channel, channel to logic
Base Power Required 5VDC	100 mA
Loop Supply	18-32 VDC
External Power Supply	18-32 VDC @ 50 mA per channel
Output Loop Compliance	Vin - 2.5V
Load Impedance	0-1375Ω (@ 32V)
Maximum Load/ Power Supply	375Ω/12V, 975Ω/24V, 1375Ω/32V
PLC Update Rate	2 channels per scan maximum
Conversion Settling Time	3 ms to 0.1% of full scale
Linearity Error (end to end)	±10 count (±0.015% of full scale) maximum

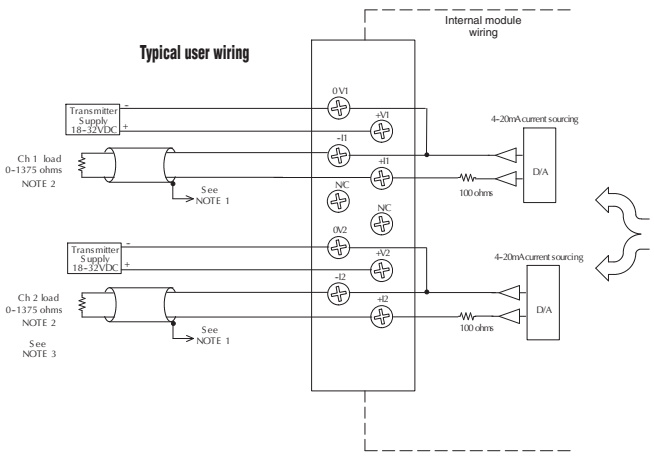
Gain Calibration Error	±32 counts (±0.05%)
Offset Calibration Error	±13 counts (±0.02%)
Output Drift	50 ppm/ºC
Maximum Inaccuracy	0.07% @ 25ºC (77ºF) 0.18% 0 to 60ºC (32º to 140ºF)
Operating Temperature	0º to 60ºC (32º to 140ºF)
Storage Temperature	-20º to 70ºC (-4º to 158ºF)
Relative Humidity	5 to 95% (non-condensing)
Environmental air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

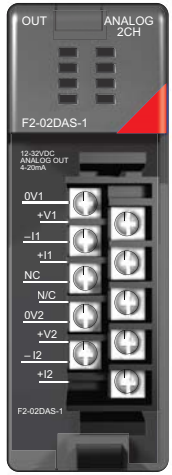
One count in the specification table is equal to one least significant bit of the analog data value (1 in 65536).

Note 1: Shields should be connected to the 0V terminal of the module.

Note 2: Load must be within compliance voltage.

Note 3: For non-isolated outputs, connect all 0V's together (0V1…0V2) and connect all +V's together (+V1…+V2).





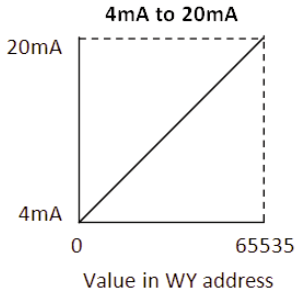
F2-02DAS-1, Analog Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-02DAS-1 WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 65535[1])
WYn+1	Channel 2 Output Data (0 to 65535[1])

WYn: Starting WY address assigned to this module

NOTE 1: *The data format of the WY addresses is 'Signed Word'. They store -32768 to 32767 as default. To read and write 0 to 65535 into these memory addresses, use the casting ':U'. (':U' is the casting for 'Unsigned' format.) For instance, if WY0 is assigned to the first analog output channel, use 'WY0:U' to access this memory address in the ladder program and other tools in Do-more Designer.*

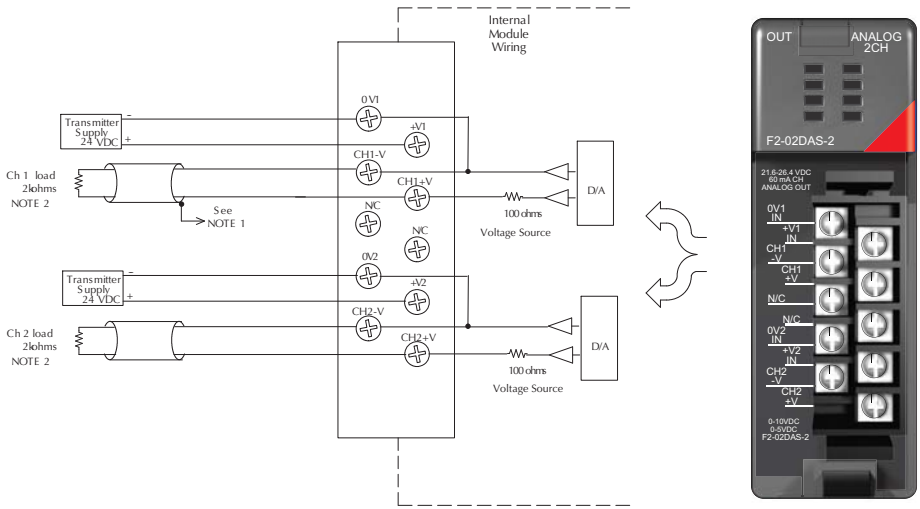


F2-02DAS-2, Analog Output

F2-02DAS-2 2-Channel Isolated Analog Voltage Output	
Number of Channels	2, isolated
Output Ranges	0-5V, 0-10V
Resolution	16 bit (1 in 65536)
Output Type	Sourced through external loop supply
Isolation Voltage	±750V continuous, channel to channel, channel to logic
Base Power Required 5VDC	60 mA
External Power Supply	21.6-26.4 VDC @ 60 mA per channel
Load Impedance	2 kΩ min
PLC Update Rate	2 channels per scan maximum
Conversion Settling Time	3ms to 0.1% of full scale
Linearity Error (end to end)	±10 count (±0.015% of full scale) maximum

Gain Calibration Error	±32 counts (±0.05%)
Offset Calibration Error	±13 counts (±0.02%)
Output Drift	50 ppm/°C
Maximum Inaccuracy	0.07% @ 25°C (77°F) 0.18% 0 to 60°C (32° to 140°F)
Operating Temperature	0° to 60°C (32° to 140°F)
Storage Temperature	-20° to 70°C (-4° to 158°F)
Relative Humidity	5 to 95% (non-condensing)
Environmental air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

Note1: Shields should be connected to the 0V of the module or the 0V of the P/S.



F2-02DAS-2, Analog Output - continued

Setting the Module Jumpers

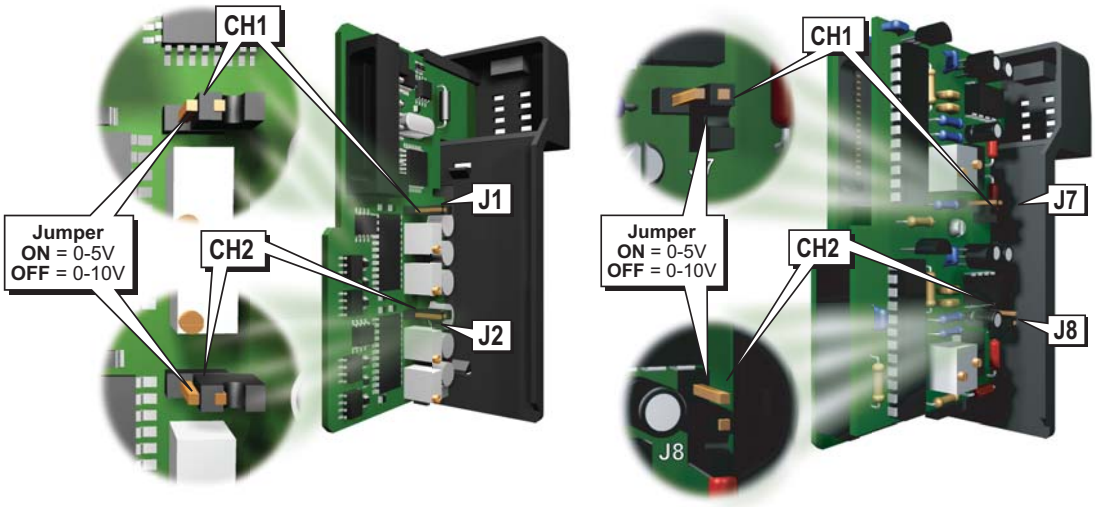
The F2-02DAS-2 Analog Output module uses jumpers for selecting the voltage range for each channel. The range of each channel can be independently set. The available operating ranges are 0-5V and 0-10V.

There is one jumper for each channel. Install or remove these jumpers to select the desired range. See the figures below to find the jumpers on your module. The module is set from the factory for the 0-5V range. Refer to the following table in order to configure module differently. Unused jumpers can be stored on a single post to prevent losing them.

NOTE: *It is important to set the module jumpers correctly. The module will not operate correctly if the jumpers are not properly set for the desired voltage range.*

Yes = Jumper Installed **No = Jumper Removed**

F2-02DAS-2 Module Jumper Table	
Voltage Range	**0-5V/0-10V Jumper**
0 to 5V	Yes
0 to 10V	No



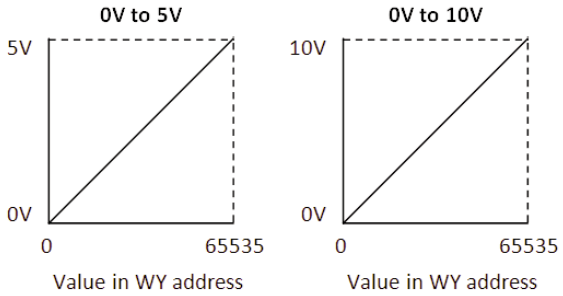
F2-02DAS-2, Analog Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-02DAS-2 WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 65535[1])
WYn+1	Channel 2 Output Data (0 to 65535[1])

WYn: Starting WY address assigned to this module

NOTE 1: *The data format of the WY addresses is 'Signed Word'. They store -32768 to 32767 as default. To read and write 0 to 65535 into these memory addresses, use the casting ':U'. (':U' is the casting for 'Unsigned' format.) For instance, if WY0 is assigned to the first analog output channel, use 'WY0:U' to access this memory address in the ladder program and other tools in Do-more Designer.*

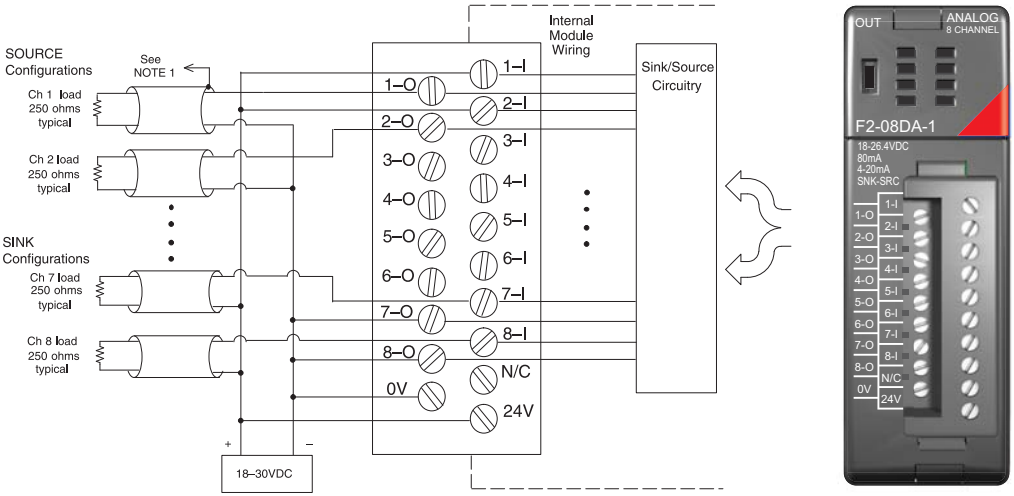


F2–08DA–1, Analog Output

F2-08DA-1 8-Channel Analog Current Output	
Number of Channels	8, single-ended
Output Ranges	4 to 20 mA
Resolution	12 bit (1 in 4096)
Output Type	Current sinking or current sourcing
Base Power Required 5VDC	30 mA
Maximum Loop Voltage	30 VDC
External Power Supply	18 to 30 VDC, 50 mA., class 2 (add 20 mA for each current loop used)
Source Load	0-400Ω @ 18-30 VDC
Sink Load	0-600Ω/18V, 0-900Ω/24V, 0-1200Ω/30V
Total Load (sink + source)	600Ω/18V, 900Ω/24V, 1200Ω/30V
PLC Update Rate	8 channels per scan maximum
Conversion Settling Time	400 µs maximum (full scale change)
Linearity Error (end to end)	±2 count (±0.050% of full scale) maximum
Full Scale Calibration Error	± 12 counts max. sinking @ any load ± 12 counts max. sourcing @ 125Ω load ± 18 counts max. sourcing @ 250Ω load ± 26 counts max. sourcing @ 400Ω load

Offset Calibration Error	± 9 counts max. sinking @ any load ± 9 counts max. sourcing @ 125Ω load ± 11 counts max. sourcing @ 250Ω load ± 13 counts max. sourcing @ 400Ω load
Maximum Full Scale Inaccuracy @ 60ºC	0.5% sinking (any load) sinking & sourcing @ 125Ω load 0.64% sourcing @ 250Ω load 0.83% sourcing @ 400Ω load
Maximum Full Scale Inaccuracy @ 25ºC (Incudes all errors and temp drift)	0.3% sinking (any load) sinking & sourcing @ 125Ω load 0.44% sourcing @ 250Ω load 0.63% sourcing @ 400Ω load
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4 to 158ºF(-20 to 70ºC)
Relative Humidity	5% to 95% (non-condensing)
Environmental air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-16IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL19 (0.5m) ZL-D2-CBL19-1 (1.0m) ZL-D2-CBL19-2 (2.0m) ZL-D2-CBL19-1P (1.0m Pigtail) ZL-D2-CBL19-2P (2.0m Pigtail)

Note 1: Shields should be connected to the 0V of the module.

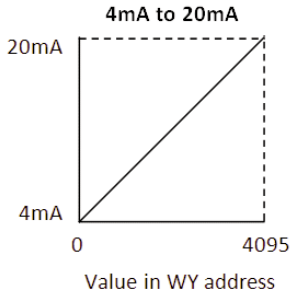


F2–08DA–1, Analog Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-08DA-1 WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 4095)
WYn+1	Channel 2 Output Data (0 to 4095)
WYn+2	Channel 3 Output Data (0 to 4095)
WYn+3	Channel 4 Output Data (0 to 4095)
WYn+4	Channel 5 Output Data (0 to 4095)
WYn+5	Channel 6 Output Data (0 to 4095)
WYn+6	Channel 7 Output Data (0 to 4095)
WYn+7	Channel 8 Output Data (0 to 4095)

WYn: Starting WY address assigned to this module

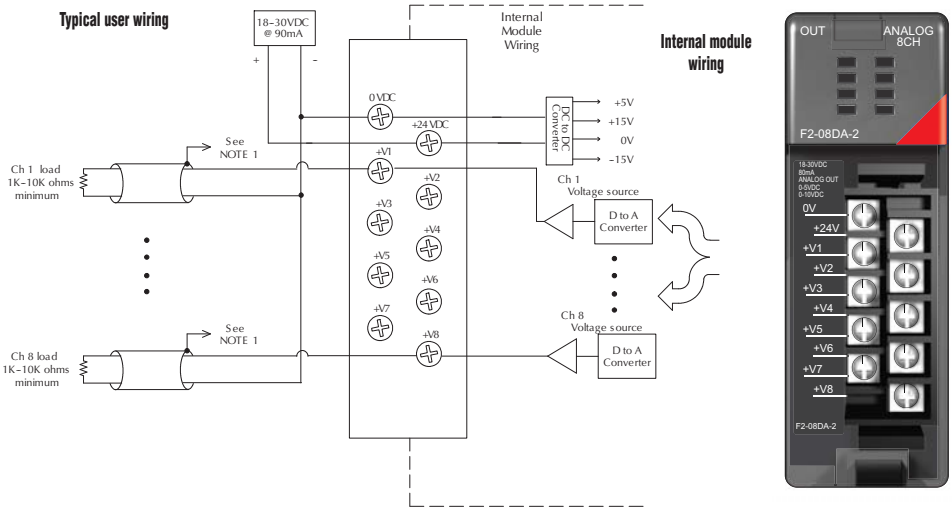


F2-08DA-2, Analog Output

F2-08DA-2 8-Channel Analog Voltage Output	
Number of Channels	8, single-ended, 1 common
Output Ranges	0 to 5V, 0 to 10V
Resolution	12 bit (1 in 4096)
Output Type	Voltage sourcing
Base Power Required 5VDC	60 mA
External Power Supply	21.6-26.4 VDC, 140 mA (outputs fully loaded)
Peak Output Voltage	15 VDC (clamped by transient voltage suppressor)
Load Impedance	1-10 kΩ
Load Capacitance	0.01 µF maximum
PLC Update Rate	8 channels per scan maximum
Conversion Settling Time	400 µs maximum (full scale change) 4.5 ms to 9 ms for digital out to analog out
Linearity Error (end to end)	±1 count (±0.025% of full scale) maximum
Full Scale Calibration Error	±12 counts max. unipolar @ 25ºC (77ºF)
Offset Calibration Error	±3 counts max., unipolar @ 25ºC (77ºF)
Accuracy vs. Temperature	±57 ppm/ºC full scale calibration change (including maximum offset change of 2 counts)
Maximum Inaccuracy	±0.3% @ 25ºC (77ºF) ±0.45% @ 0-60ºC (32-140ºF)
Operating Temperature	0º to 60ºC (32º to 140°F)
Storage Temperature	-20º to 70ºC (-4º to 158ºF)
Relative Humidity	5 to 95% (non-condensing)
Environmental air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

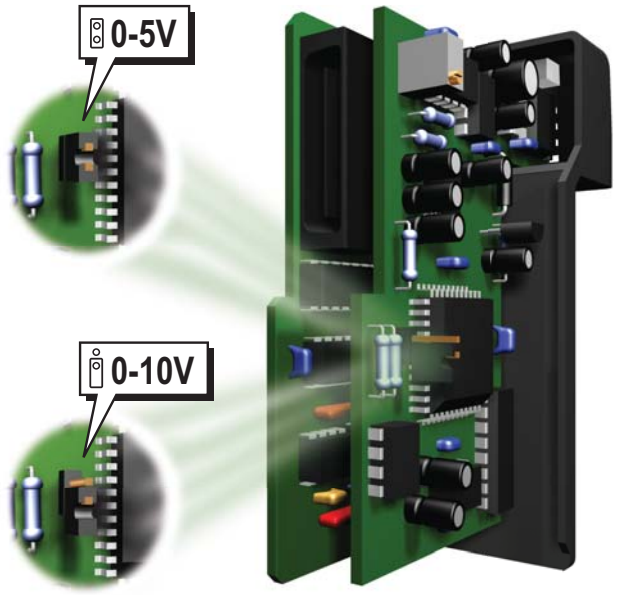
Note 1: Shields should be connected to the 0V of the module.



F2-08DA-2, Analog Output- continued

Setting the Module Jumpers

The F2-08DA-2 module uses one jumper to select between the 0-5V or 0-10V operating ranges. Refer to the following figure and table for proper selection of voltage range. The output data format remains 0-4095 for either voltage range selected. Unused jumpers can be stored on a single post to prevent losing them.



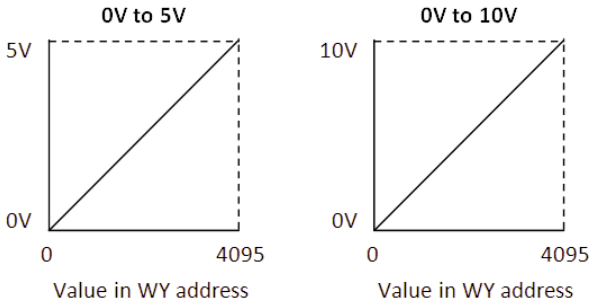
F2-08DA-2 Module Jumper Table		
Voltage Range	*Output Data Format*	*0-5V/0-10V Jumper(top board)*
0 to 5V	*0 to 4095*	Yes
0 to 10V	*0 to 4095*	No

F2-08DA-2, Analog Output- continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-08DA-2 WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 4095)
WYn+1	Channel 2 Output Data (0 to 4095)
WYn+2	Channel 3 Output Data (0 to 4095)
WYn+3	Channel 4 Output Data (0 to 4095)
WYn+4	Channel 5 Output Data (0 to 4095)
WYn+5	Channel 6 Output Data (0 to 4095)
WYn+6	Channel 7 Output Data (0 to 4095)
WYn+7	Channel 8 Output Data (0 to 4095)

WYn: Starting WY address assigned to this module

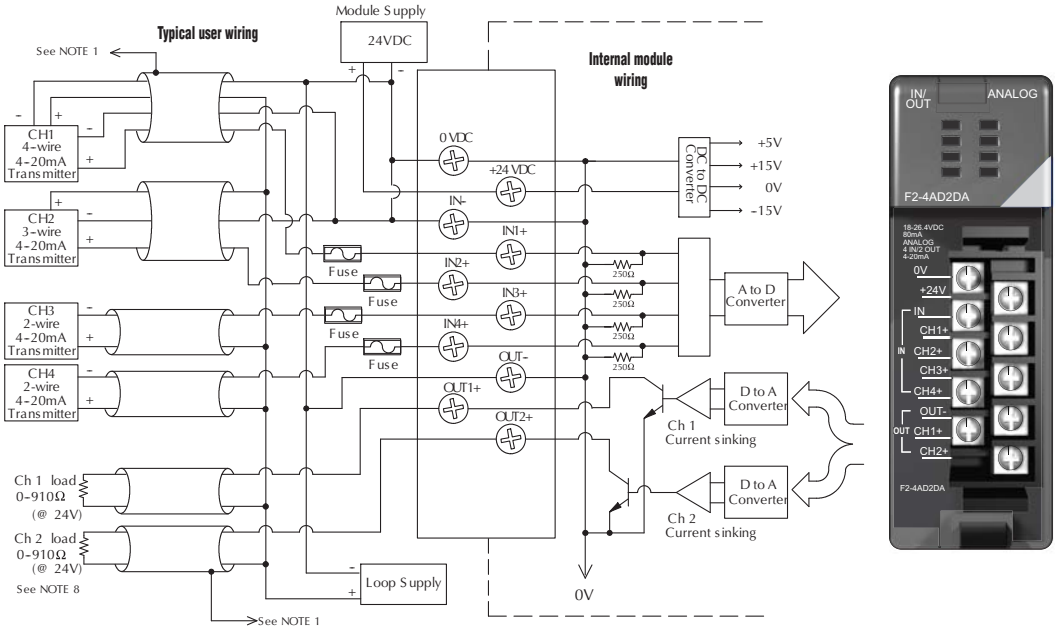


F2–4AD2DA, Analog Input/Output

F2-4AD2DA 4-Channel Analog Current Input / 2-Channel Analog Current Output	
Number of Input Channels	4, single-ended (1 common)
Number of Output Channels	2, single-ended (1 common)
Ranges	4 to 20 mA current (current sinking)
Resolution	12 bit (1 in 4096)
Peak Withstanding Voltage	75 VDC, current outputs
Maximum Continuous Overload	-40 to +40 mA, each current output
Input Impedance	250Ω, ±0.1%, 1/2W, 25 ppm/°C current input resistance
External Load Resistance	0Ω minimum, current outputs
Maximum Loop Supply	30 VDC
Recommended Fuse	0.032A, series 217 fast-acting, current inputs
Maximum Load/Power Supply	910Ω/24V, current outputs 620Ω/18V, 1200 Ω/30 V
Active Low-pass Filter	-3 dB @ 20 Hz, 2 poles (-12 dB per octave)
Linearity Error (best fit)	±1 count (±0.025% of full scale) maximum
Output Settling Time	100 µs maximum (full scale change)

Accuracy vs. Temperature	±50 ppm/°C full scale calibration change (including maximum offset change)
Maximum Inaccuracy	±0.1% @ 77°F (25°C) ±0.3% @ 32 to 140°F (0 to 60°C)
PLC Update Rate	4 input channels per scan maximum 2 output channels per scan maximum
Base Power Required 5VDC	90 mA
External Power Supply Requirement	18-26.4 VDC @ 80 mA 20 mA per loop
Operating Temperature	32° to 140°F (0° to 60°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Terminal Type (included)	Removable; D2-8IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL10 (0.5m) ZL-D2-CBL10-1 (1.0m) ZL-D2-CBL10-2 (2.0m)

F2–4AD2DA, Analog Input/Output - continued



One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

Note 1: Shields should be connected at their respective signal source.

Note 2: Unused channel should remain open for minimum power consumption.

Note 3: More than one external power supply can be used provided the power supply commons are connected.

Note 4: A Series 217, 0.032A fast-acting fuse is recommended for 4-20 mA current input loops.

Note 5: f the power supply common of an external power supply is not connected to 0 VDC on the module, then the output of the external transmitter must be isolated. To avoid "ground loop" errors, recommended 4-20 mA transmitter types are: 2 or 3 wire - Isolation between input signal and power supply or 4 wire - Isolation between input signal, power supply, and 4-20 mA output.

Note 6: If an analog channel is connected backwards, then erroneous data values will be returned for that channel.

Note 7: To avoid small errors due to terminal block losses, connect 0 VDC, IN-, and OUT- on the terminal block as shown. The module's internal connection alone of these nodes is not sufficient to permit module performance up to the accuracy specifications.

Note 8: Choose an output transducer resistance according to the maximum load/power listed in the Output Specifications.

F2–4AD2DA, Analog Input/Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-4AD2DA X Addressing	
Address	**Description**
Xn	On when the external 24VDC input power is missing or terminal block is removed.
Xn+1	On when the external 24VDC input power is missing or terminal block is removed.
Xn+2	On when the external 24VDC input power is missing or terminal block is removed.
Xn+3	On when the external 24VDC input power is missing or terminal block is removed.
Xn+4	Not used
Xn+5	Not used
Xn+6	Not used
Xn+7	Not used

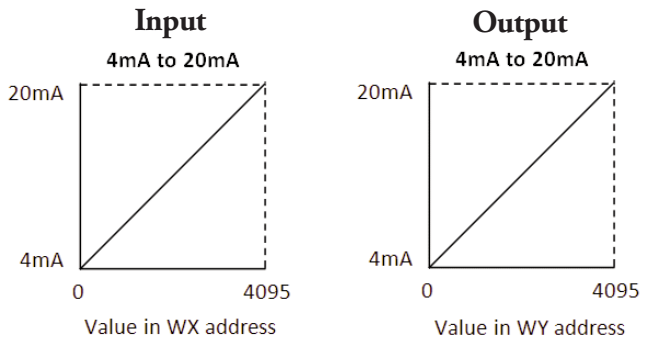
Xn: Starting X address assigned to this module

F2-4AD2DA WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (0 to 4095)
WXn+1	Channel 2 Input Data (0 to 4095)
WXn+2	Channel 3 Input Data (0 to 4095)
WXn+3	Channel 4 Input Data (0 to 4095)

WXn: Starting WX address assigned to this module

F2-4AD2DA WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 4095)
WYn+1	Channel 2 Output Data (0 to 4095)

WYn: Starting WY address assigned to this module



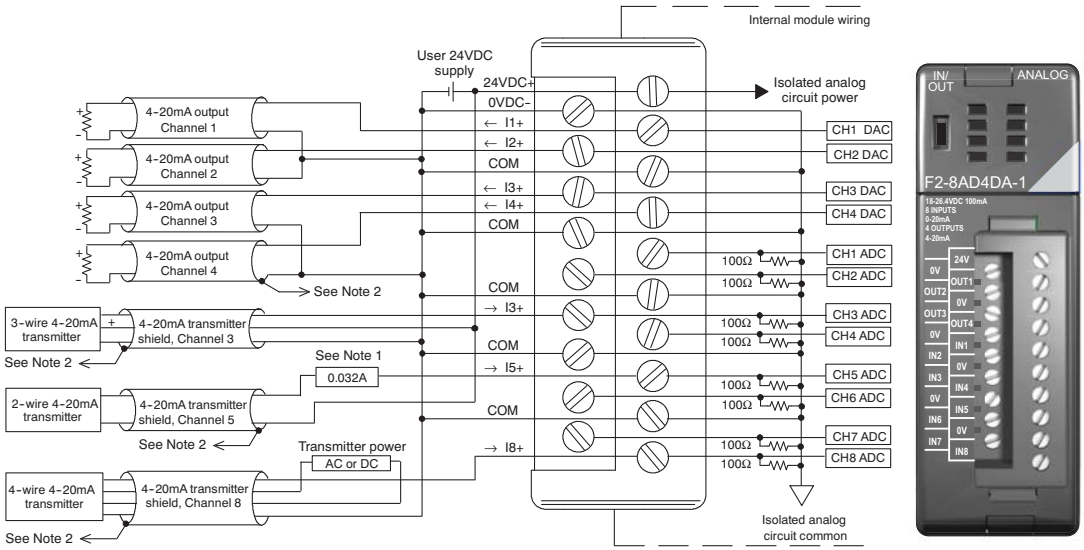
F2-8AD4DA-1 Analog Input/Output

F2-8AD4DA-1 8-Channel Analog Current Input / 4-Channel Analog Current Output	
Input Channels per Module	8, single ended (one common)
Input Range	0 to 20 mA
Resolution	12, 14, 16-bit selectable
External DC Power Required	100 mA @ 18-26.4 VDC
Max. Continuous Overload	±45 mA
Input Impedance	100Ω 0.1% 1/4W
Filter Characteristics	Active low pass, -3dB @ 80 Hz
Conversion Time	12-bit = 1.5 ms per channel 14-bit = 6 ms per channel 16-bit = 25 ms per channel
Conversion Method	Over sampling successive approximation
Accuracy vs. Temperature	±25 ppm / °C Max.
Maximum Inaccuracy	0.1% of range
Linearity Error (End to End)	12-bit = ±2 count max. (±0.06% of range) 14-bit = ±10 count max. (±0.06% of range) 16-bit = ±20 count max. (±0.06% of range) Monotonic with no missing codes
Full Scale Calibration Error (not incl. offset error)	±0.07% of range max.
Offset Calibration Error	±0.03% of range max.
Rec. Fuse (external)	0.032A, Littelfuse Series 217 fast-acting
Base Power Required 5VDC	35 mA

Output Channels per Module	4
Output Range	4 to 20 mA
Resolution	16-bit, 0.244 mA/bit
Output Type	Current sourcing at 20 mA max.
Load Impedance	0-750Ω
Max. Inaccuracy	0.25% of range
Max. Full Scale Calibration Error (not incl. offset error)	±0.075% of range max.
Max. Offset Calibration Error	±0.1% of range max.
Accuracy vs. Temperature	±25 ppm/ °C max. full scale calibration change (± 0.0025% of range / °C)
Max. Crosstalk at DC, 50/60Hz	-70 dB, 1 LSB
Linearity Error (End to End)	±1 count max. (±0.025% of full scale) Monotonic with no missing codes
Output Stability and Repeatability	±1 LSB after 10 min. warm-up typical
Output Ripple	0.005% of full scale
Output Settling Time	0.5 ms max., 5 µs min. (full scale change)
Max. Continuous Overload	Outputs open circuit protected
Type of Output Protection	Electronically current limited to 20 mA or less
Output Signal at Power-up and Power-down	4 mA
Terminal Type (included)	Removable; D2-16IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL19 (0.5m) ZL-D2-CBL19-1 (1.0m) ZL-D2-CBL19-2 (2.0m) ZL-D2-CBL19-1P (1.0m Pigtail) ZL-D2-CBL19-2P (2.0m Pigtail)

NOTE: *Module revision B1 or newer of the F2-8AD4DA-1 (found on the product label) must be used with the Do-more PLC.*

F2-8AD4DA-1 Analog Input/Output - continued



Note 1: A Littlefuse Series 217, 0.032A fast-acting fuse is recommended for all 4-20mA current loop inputs.

Note 2: Connect shields to the 0V of the module; do not connect both ends of shield.

F2-8AD4DA-1 Analog Input/Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-8AD4DA-1 X Addressing	
Address	**Description**
Xn	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+1	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+2	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+3	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+4	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+5	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+6	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.
Xn+7	On when the transmitter is broken, the external 24VDC input power is missing or terminal block is removed.

Xn: Starting X address assigned to this module

F2-8AD4DA-1 WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+1	Channel 2 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+2	Channel 3 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+3	Channel 4 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+4	Channel 5 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+5	Channel 6 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+6	Channel 7 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+7	Channel 8 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])

WXn: Starting WX address assigned to this module

The resolution of each analog input channel can be selected separately. Available resolutions are 12 bit (0 to 4095), 14 bit (0 to 16383) and 16 bit (0 to 65535). You need to use the memory address WYn+4 to select the resolutions. Please refer to the next page for details.

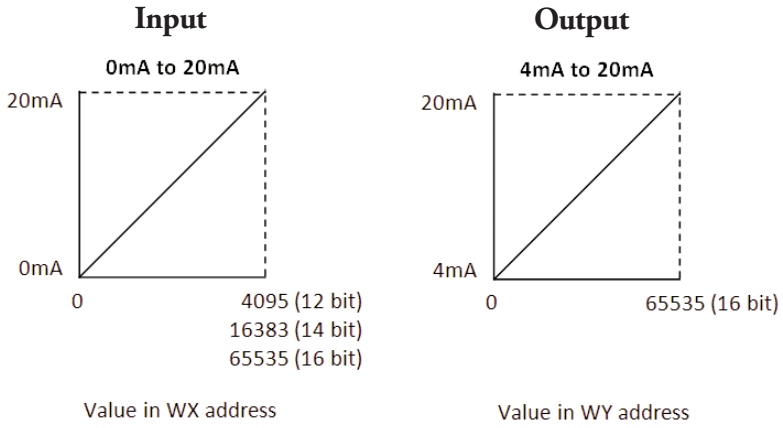
NOTE 1: *The data format of the WX addresses is 'Signed Word'. They store -32768 to 32767 as default. To read and write 0 to 65535 into these memory addresses, use the casting ':U'. (':U' is the casting for 'Unsigned' format.) For instance, if you selected the 16 bit resolution for the first analog input channel and WX0 is assigned to the channel, use 'WX0:U' to access this memory address in the ladder program and other tools in Do-more Designer.*

F2-8AD4DA-1 Analog Input/Output - continued

F2-8AD4DA-1 WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 65535[2])
WYn+1	Channel 2 Output Data (0 to 65535[2])
WYn+2	Channel 3 Output Data (0 to 65535[2])
WYn+3	Channel 4 Output Data (0 to 65535[2])
WYn+4	Input Resolution Selection
WYn+5	Not used
WYn+6	Input Track and Hold Selection

WYn: Starting WY address assigned to this module

NOTE 2: *The data format of the WY addresses is 'Signed Word'. They store -32768 to 32767 as default. To read and write 0 to 65535 into these memory addresses, use the casting ':U'. (':U' is the casting for 'Unsigned' format.) For instance, if WY0 is assigned to the first analog output channel, use 'WY0:U' to access this memory address in the ladder program and other tools in Do-more Designer.*

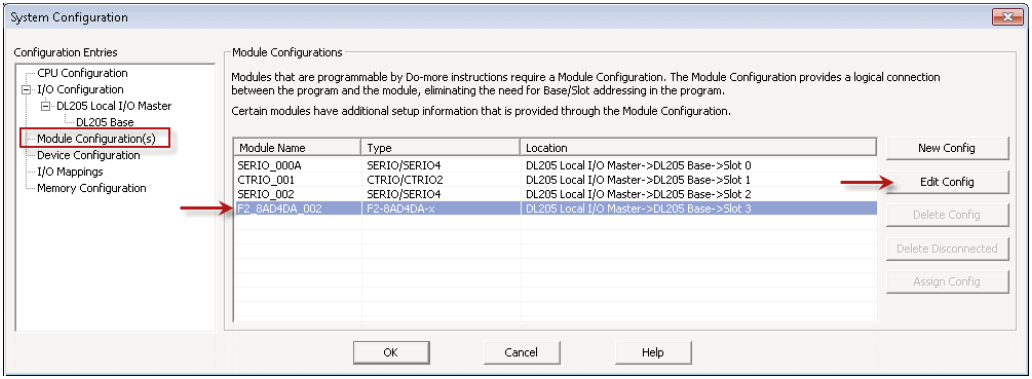


F2-8AD4DA-1 Analog Input/Output - continued

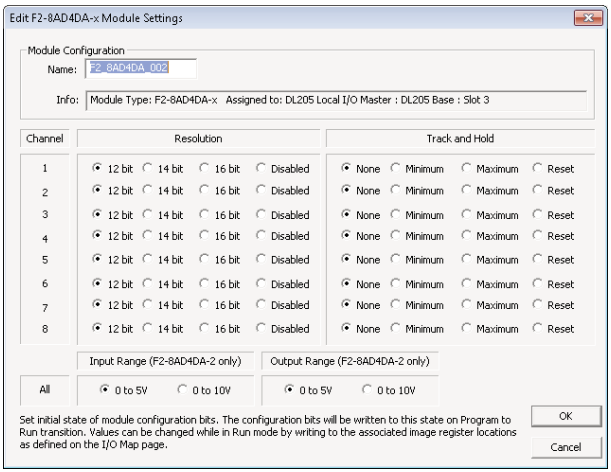
Input Configuration Using Do-more Designer Version 1.1 or Newer

Using the Module Configurations section of the Do-more Designer System Configuration, each of the eight input channels can be individually configured for resolutions: 12, 14, or 16 bit, configured for track and hold options: None (no hold), Minimum, Maximum, or Reset held value, or each input can be individually disabled.

From the System Configurations page, select Module Configuration(s) in the tab on the left. The screen below will appear showing the modules that are pre-configurable. Select the Type F2-8AD4DA-x in the table and click the Edit Config button on the righthand side.



Once the Edit Config button is selected, the Module Settings page shown below will open. From this page each input channel can be configured with Resolution and/or Track and Hold options. Select the radial button next to the desired option for each input and select the OK button when done.


Edit F2-8AD4DA-x Module Setting:
Module Configuration
Name: F2_8AD4DA_002
Info: Module Type: F2-8AD4DA-x Assigned to: DL205 Local I/O Master : DL205 Base : Slot 3
Channel
Resolution
Track and Hold
12 bit 14 bit 16 bit Disabled
None Minimum Maximum Reset
Input Range (F2-8AD4DA-2 only)
Output Range (F2-8AD4DA-2 only)
All
0 to 5V 0 to 10V
Set initial state of module configuration bits. The configuration bits will be written to this state on Program to Run transition. Values can be changed while in Run mode by writing to the associated image register locations as defined on the I/O Map page.
OK
Cancel

NOTE: *The Input and Output Range selections are for the F2-8AD4DA-2 module only.*

F2-8AD4DA-1 Analog Input/Output - continued

Input Resolution Selection (WYn+4)

If not using Do-more Designer version 1.1 or newer, each of the eight input channels can be individually configured for 12, 14, or 16 bit resolution or disabled with memory address WYn+4. (WYn: Starting WY address assigned to this module) 2 bits in this memory address are assigned to each analog input channel.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
R-8H	R-8L	R-7H	R-7L	R-6H	R-6L	R-5H	R-5L	R-4H	R-4L	R-3H	R-3L	R-2H	R-2L	R-1H	R-1L

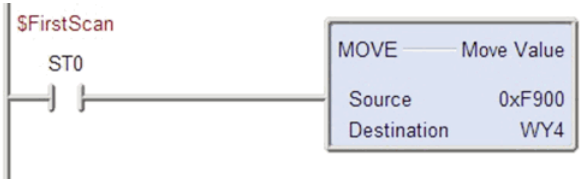
Channel Resolution Selection Table		
Input Resolution	RnH (Resolution channel n High bit)	RnL (Resolution channel n Low bit)
12 bit	0	0
14 bit	0	1
16 bit	1	0
Disabled	1	1

The HEX data format is used to set up the input resolution as seen in the following example.

Example: An F2-8AD4DA-1 is installed in slot 0 and WY4 is used for the input resolution selection. Input channels 1-4 are 12 bit, channel 5 is 14 bit, channel 6 is 16 bit, and channels 7 and 8 are disabled. In this case, 0xF900 needs to be written into WY4.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
R-8H	R-8L	R-7H	R-7L	R-6H	R-6L	R-5H	R-5L	R-4H	R-4L	R-3H	R-3L	R-2H	R-2L	R-1H	R-1L
1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0
F				9				0				0			

Use the MOVE instruction to write the Hex value 0xF900 into WY4.



F2-8AD4DA-1 Analog Input/Output - continued

Input Track and Hold Selection (WYn+6)

The track and hold feature for each of the eight inputs can be individually configured for minimum, maximum, no hold, or reset held value with memory address WYn+6. (WYn: Starting WY address assigned to this module) This configuration can be changed "on the fly" while the program is running. 2 bits in this memory address are assigned to each analog input channel.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
T-8H	T-8L	T-7H	T-7L	T-6H	T-6L	T-5H	T-5L	T-4H	T-4L	T-3H	T-3L	T-2H	T-2L	T-1H	T-1L

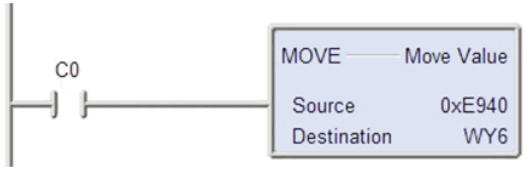
Channel Track and Hold Selection Table			
Track and Hold Select	**TnH (Track and Hold channel n High bit)**	**TnL (Track and Hold channel n Low bit)**	**Result**
No Track and Hold	0	0	Returns real time input value
Track and Hold Minimum Value	0	1	Maintains lowest measured value
Track and Hold Maximum Value	1	0	Maintains highest measured value
Reset Track and Hold Value	1	1	Resets previously held input value

The HEX data format is used to set up the track and hold option as seen in the following example.

Example: An F2-8AD4DA-1 is installed in slot 0 and WY6 is used for the track and hold selection. Input channel track and hold settings: ch 1-3 = none, ch 4-5 = minimum, ch 6-7 = maximum, ch 8 = reset. In this case, 0xE940 needs to be written into WY6.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
T-8H	T-8L	T-7H	T-7L	T-6H	T-6L	T-5H	T-5L	T-4H	T-4L	T-3H	T-3L	T-2H	T-2L	T-1H	T-1L
1	1	1	0	1	0	0	1	0	1	0	0	0	0	0	0
E				9				4				0			

Use the MOVE instruction to write the Hex value 0xE940 into WY6.

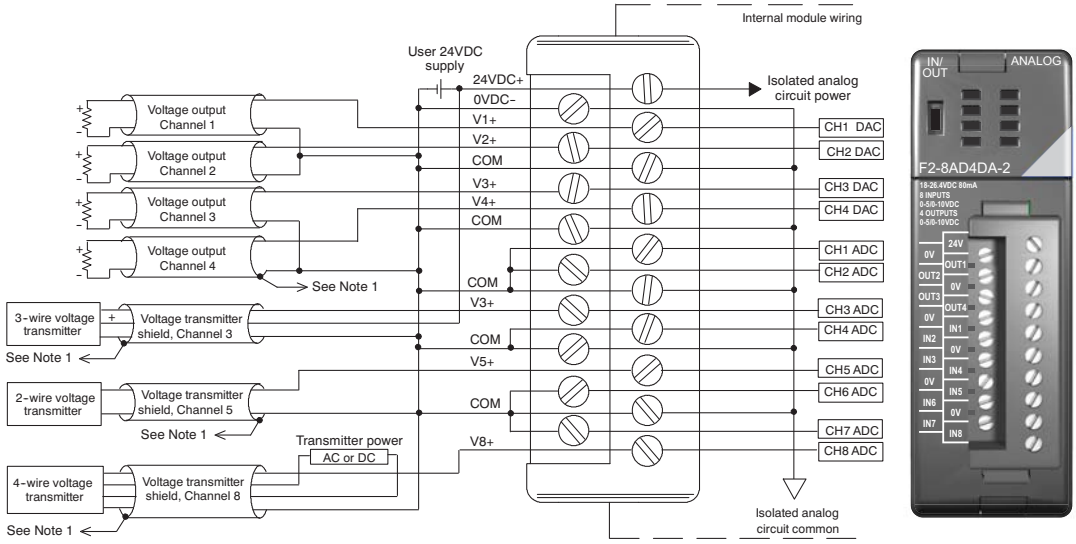


F2-8AD4DA-2 Analog Input/Output

F2-8AD4DA-2 8-Channel Analog Voltage Input / 4-Channel Analog Voltage Output	
Input Channels per Module	8, single ended (one common)
Input Range	0 to 5V, 0 to 10V
Resolution	12, 14, 16-bit selectable
External DC Power Required	80 mA @ 18-26.4 VDC
Max. Continuous Overload	±100 V
Input Impedance	>10 MΩ
Filter Characteristics	Active low pass, -3 dB @ 80 Hz
Conversion Time	12-bit = 1.5 ms per channel 14-bit = 6 ms per channel 16-bit = 25 ms per channel
Conversion Method	Over sampling successive approximation
Accuracy vs. Temperature	±50 ppm / °C Max.
Maximim Inaccuracy	0.1% of range
Linearity Error (End to End)	12-bit = ±1 count max. (±0.025% of range) 14-bit = ±4 count max. (±0.025% of range) 16-bit = ±16 count max. (±0.025% of range) Monotonic with no missing codes
Full Scale Calibration Error (not incl. offset error)	±0.075% of range max.
Offset Calibration Error	±0.025% of range max.
Base Power Required 5VDC	35 mA

Output Channels per Module	4
Output Range	0 to 5V, 0 to 10V
Resolution	0 to 5V at 15-bit, 0 to10V at 16-bit, 152 µV/bit
Output Type	Voltage sourcing/sinking at 10 mA max.
Load Impedance	>1000Ω
Max. Inaccuracy	0.15% of range
Max. Full Scale Calibration Error (not incl. offset error)	±0.075% of range max.
Max. Offset Calibration Error	±0.025% of range max.
Accuracy vs. Temperature	±50 ppm/ °C max. full scale calibration change (± 0.005% of range / °C)
Max. Crosstalk @ DC, 50/60Hz	-70 dB, 1 LSB
Linearity Error (End to End)	±1 count max. (±0.025% of full scale) Monotonic with no missing codes
Output Stability and Repeatability	±1 LSB after 10 min. warm-up typical
Output Ripple	0.005% of full scale
Output Settling Time	0.5 ms max., 5 µs min. (full scale change)
Max. Continuous Overload	Outputs current limited to 15 mA typical
Type of Output Protection	1 VDC peak output voltage (clamped by transient voltage suppressor)
Output Signal at Power-up and Power-down	0V
Terminal Type (included)	Removable; D2-16IOCON
ZIPLink Module	ZL-RTB20 (Feedthrough)
ZIPLink Cable	ZL-D2-CBL19 (0.5m) ZL-D2-CBL19-1 (1.0m) ZL-D2-CBL19-2 (2.0m) ZL-D2-CBL19-1P (1.0m Pigtail) ZL-D2-CBL19-2P (2.0m Pigtail)

F2-8AD4DA-2 Analog Input/Output - continued



Note 1: Connect shields to the 0V of the module; do not connect both ends of shield.

F2-8AD4DA-2 Analog Input/Output - continued

The Do-more CPU module assigns the following memory addresses to this module.

F2-8AD4DA-2 X Addressing	
Address	**Description**
Xn	Not Used
Xn+1	Not Used
Xn+2	Not Used
Xn+3	Not Used
Xn+4	Not Used
Xn+5	Not Used
Xn+6	Not Used
Xn+7	Not Used

Xn: Starting X address assigned to this module

F2-8AD4DA-2 WX Addressing	
Address	**Description**
WXn	Channel 1 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+1	Channel 2 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+2	Channel 3 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+3	Channel 4 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+4	Channel 5 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+5	Channel 6 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+6	Channel 7 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])
WXn+7	Channel 8 Input Data (0 to 4095, 0 to 16383 or 0 to 65535[1])

WXn: Starting WX address assigned to this module

The resolution of each analog input channel can be selected separately. Available resolutions are 12 bit (0 to 4095), 14 bit (0 to 16383) and 16 bit (0 to 65535). You need to use the memory address WYn+4 to select the resolutions. Please refer to the next page for details.

NOTE 1: *The data format of the WX addresses is 'Signed Word'. They store -32768 to 32767 as default. To read and write 0 to 65535 into these memory addresses, use the casting ':U'. (':U' is the casting for 'Unsigned' format.) For instance, if you selected the 16 bit resolution for the first analog input channel and WX0 is assigned to the channel, use 'WX0:U' to access this memory address in the ladder program and other tools in Do-more Designer.*

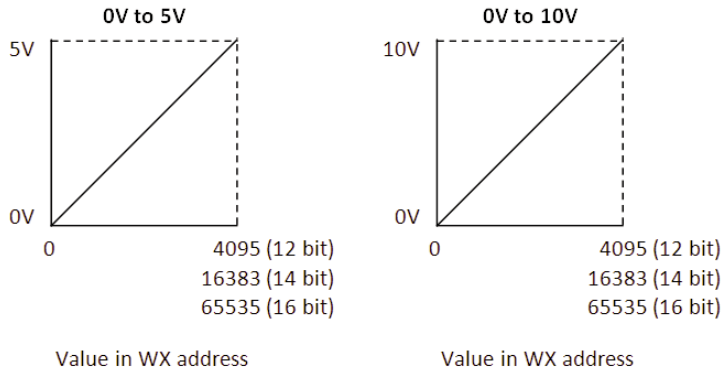
F2-8AD4DA-2 Analog Input/Output - continued

F2-8AD4DA-2 WY Addressing	
Address	**Description**
WYn	Channel 1 Output Data (0 to 65535[2])
WYn+1	Channel 2 Output Data (0 to 65535[2])
WYn+2	Channel 3 Output Data (0 to 65535[2])
WYn+3	Channel 4 Output Data (0 to 65535[2])
WYn+4	Input Resolution Selection
WYn+5	Input and Output Ranges Selection
WYn+6	Input Track and Hold Selection

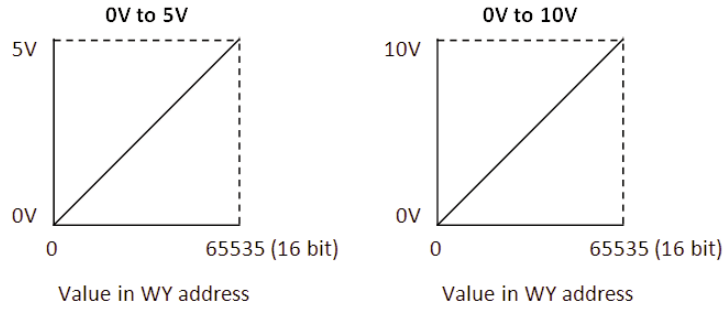
WYn: Starting WY address assigned to this module

NOTE 2: *The data format of the WY addresses is 'Signed Word'. They store -32768 to 32767 as default. To read and write 0 to 65535 into these memory addresses, use the casting ':U'. (':U' is the casting for 'Unsigned' format.) For instance, if WY0 is assigned to the first analog output channel, use 'WY0:U' to access this memory address in the ladder program and other tools in Do-more Designer.*

Input



Output

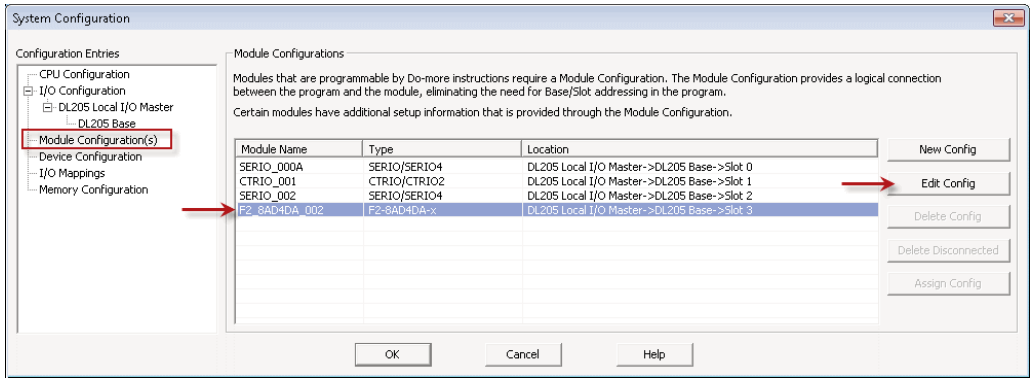


F2-8AD4DA-2 Analog Input/Output - continued

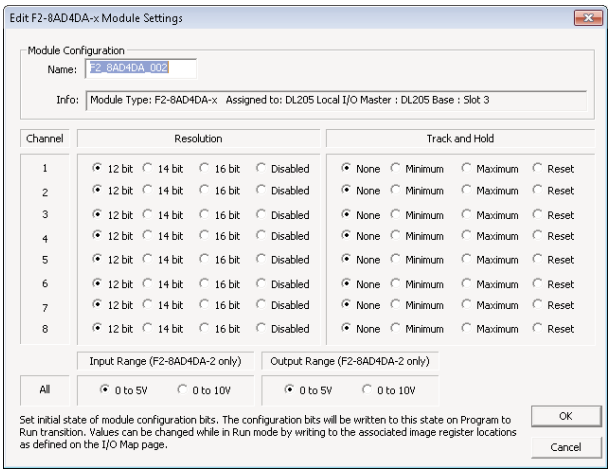
Input Configuration Using Do-more Designer Version 1.1 or Newer

Using the Module Configurations section of the Do-more Designer System Configuration, each of the eight input channels can be individually configured for resolutions: 12, 14, or 16 bit, configured for track and hold options: None (no hold), Minimum, Maximum, or Reset held value, or each input can be individually disabled. Input and output ranges can also be configured for 0 to 5V or 0 to 10V in this section.

From the System Configurations page, select Module Configuration(s) in the tab on the left. The screen below will appear showing the modules that are pre-configurable. Select the Type F2-8AD4DA-x in the table and click the Edit Config button on the righthand side.



Once the Edit Config button is selected, the Module Settings page shown below will open. From this page each input channel can be configured with Resolution and/or Track and Hold options. Input/output range options are also available. Select the radial button next to the desired options and select the OK button when done.


Edit F2-8AD4DA-x Module Settings
Module Configuration
Name: F2_8AD4DA_002
Info: Module Type: F2-8AD4DA-x Assigned to: DL205 Local I/O Master : DL205 Base : Slot 3
Channel
Resolution
Track and Hold
12 bit 14 bit 16 bit Disabled
None Minimum Maximum Reset
Input Range (F2-8AD4DA-2 only)
Output Range (F2-8AD4DA-2 only)
All
0 to 5V 0 to 10V
Set initial state of module configuration bits. The configuration bits will be written to this state on Program to Run transition. Values can be changed while in Run mode by writing to the associated image register locations as defined on the I/O Map page.
OK
Cancel

F2-8AD4DA-2 Analog Input/Output - continued

Input Resolution Selection (WYn+4)

If not using Do-more Designer version 1.1 or newer, each of the eight input channels can be individually configured for 12, 14, or 16 bit resolution or disabled with memory address WYn+4. (WYn: Starting WY address assigned to this module) 2 bits in this memory address are assigned to each analog input channel.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
R-8H	R-8L	R-7H	R-7L	R-6H	R-6L	R-5H	R-5L	R-4H	R-4L	R-3H	R-3L	R-2H	R-2L	R-1H	R-1L

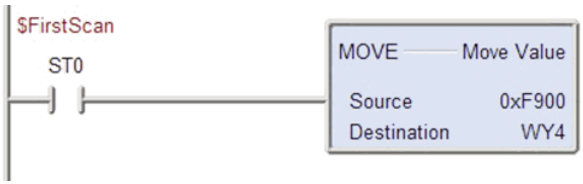
Channel Resolution Selection Table		
Input Resolution	RnH (Resolution channel n High bit)	RnL (Resolution channel n Low bit)
12 bit	0	0
14 bit	0	1
16 bit	1	0
Disabled	1	1

The HEX data format is used to set up the input resolution as seen in the following example.

Example: An F2-8AD4DA-2 is installed in slot 0 and WY4 is used for the input resolution selection. Input channels 1-4 are 12 bit, channel 5 is 14 bit, channel 6 is 16 bit, and channels 7 and 8 are disabled. In this case, 0xF900 needs to be written into WY4.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
R-8H	R-8L	R-7H	R-7L	R-6H	R-6L	R-5H	R-5L	R-4H	R-4L	R-3H	R-3L	R-2H	R-2L	R-1H	R-1L
1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0
F				9				0				0			

Use the MOVE instruction to write the Hex value 0xF900 into WY4.



F2-8AD4DA-2 Analog Input/Output - continued

Input and Output Range Selection (WYn+5)

The range of the eight input channels can be collectively set for 0 to 5V or for 0 to10V. The range of the four output channels can also be collectively set for either of the same two voltage ranges. The configuration is stored in memory address WYn+5. (WYn: Starting WY address assigned to this module) Only 2 bits in this memory address are used for the setup.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	OR	-	-	-	-	-	-	-	IR

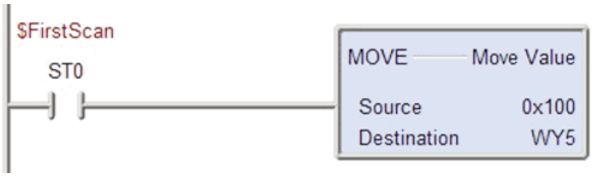
Input/Output Range Selection Table		
Input/Output Range	IR (Input Range)	OR (Output Range)
0V to 5V	0	0
0V to 10V	1	1

The HEX data format is used to set up the input resolution as seen in the following example.

Example: An F2-8AD4DA-2 is installed in slot 0 and WY5 is used for the input and output resolution selection. Input channel range is set to 0 to 5V and output channel range is set to 0 to 10V. In this case, 0x100 needs to be written into WY5.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	OR	-	-	-	-	-	-	-	IR
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0				1				0				0			

Use the MOVE instruction to write the Hex value 0x100 into WY5.



F2-8AD4DA-2 Analog Input/Output - continued

Input Track and Hold Selection (WYn+6)

The track and hold feature for each of the eight inputs can be individually configured for minimum, maximum, no hold, or reset held value with memory address WYn+6. (WYn: Starting WY address assigned to this module) This configuration can be changed "on the fly" while the program is running. 2 bits in this memory address are assigned to each analog input channel.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
T-8H	T-8L	T-7H	T-7L	T-6H	T-6L	T-5H	T-5L	T-4H	T-4L	T-3H	T-3L	T-2H	T-2L	T-1H	T-1L

Channel Track and Hold Selection Table

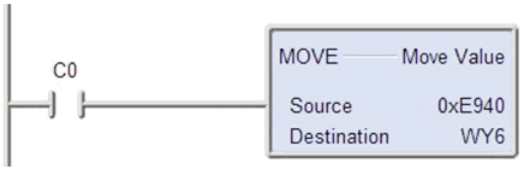
Track and Hold Select	TnH (Track and Hold channel n High bit)	TnL (Track and Hold channel n Low bit)	Result
No Track and Hold	0	0	Returns real time input value
Track and Hold Minimum Value	0	1	Maintains lowest measured value
Track and Hold Maximum Value	1	0	Maintains highest measured value
Reset Track and Hold Value	1	1	Resets previously held input value

The HEX data format is used to set up the track and hold option as seen in the following example.

Example: An F2-8AD4DA-2 is installed in slot 0 and WY6 is used for the track and hold selection. Input channel track and hold settings: ch 1-3 = none, ch 4-5 = minimum, ch 6-7 = maximum, ch 8 = reset. In this case, 0xE940 needs to be written into WY6.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
T-8H	T-8L	T-7H	T-7L	T-6H	T-6L	T-5H	T-5L	T-4H	T-4L	T-3H	T-3L	T-2H	T-2L	T-1H	T-1L
1	1	1	0	1	0	0	1	0	1	0	0	0	0	0	0
E				9				4				0			

Use the MOVE instruction to write the Hex value 0xE940 into WY6.



Notes: